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Pasadena, California

**GEOPHYSICS CORPORATION OF AMERICA**

**Bedford, Massachusetts**

**Final Report - First Phase**

**For The Period 31 July 1961 to 28 January 1962**

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**SPUTTERING ION SOURCE STUDY PROGRAM**

**CONTRACT NO. 950118**

**FILE 2628**

**28 January 1962**

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# 1. Introduction

The goal of the work was to study the performance of a novel ion source for solids, whereby the ions are produced by sputtering from a surface which is bombarded by high energy ions. The primary ions shall be concentrated on the bombarded target sample surface either to a focus of about 1 mm diameter in one instance, and, for a different type of experiment, to a focus of about 6 mm diameter. The first arrangement is intended to be used to study the inhomogeneity of the sample, the second one shall be used to obtain an average composition. Both experiments can be performed with basically the same overall arrangement by selecting the proper size of holes in the source aperture plate and in the deflection condenser aperture plates. These diaphragms have been made exchangeable.

The first phase of the work, which is now completed, involved the design construction and assembly of the test apparatus. The testing and evaluation will be subject of the forthcoming second phase of the contract.

## 2. Design Considerations

### 2.1 Primary Ion Source

The first important decision was to choose the source of the primary ions. For the intended use it was supposed to deliver an ion beam having the following features: high ion current density, small angular spread, small energy spread. Also, the gas efficiency should be as high as possible in order to be able to maintain a sufficiently low pressure in the sputtering region. In the original work of Herzog and Viebock,<sup>(1)</sup> a canal-ray tube was used. In the meantime, other ion sources with better properties have been developed. A thorough survey of the literature on the subject led to the decision to use a so called Duoplasmatron Ion Source,<sup>(2)</sup> which was developed about twelve years ago and has gained widespread use since then. It has been reported to emit a hydrogen ion beam of up to 1 ampere from an 1.4 mm diameter opening with continuous operation, and even more with pulsed operation.<sup>(3)</sup> The energy spread is only about 20 ev and the gas efficiency is more than 90%.

In the Duoplasmatron a low pressure arc discharge is constricted by a funnel-shaped baffle (see Figure 1) placed between the electron emitting cathode and the anode. A strong axial magnetic field between the baffle and the anode further constricts the discharge. These constrictions largely enhance the current density as compared with that in a free arc of equal total current. A fraction of the plasma is driven by kinetic and magnetic forces towards the ion extraction aperture in the anode, from where the positive ions can be extracted and



accelerated by a strong electric field. With the aid of an electrostatic einzel lens the ion beam can be focused on a target. The diameter of the focus can be varied simply by varying the potential of the middle electrode of the einzel lens. The smallest diameter of the focus achievable is determined by the diameter of the ion extraction aperture in the Duoplasmatron anode and by the enlargement ratio of the system. There is reason to assume<sup>(4)</sup> that maximum yield of sputtered ions is to be expected at energies of the bombarding ions between 20 and 30 kv, which will be the acceleration voltage to be worked with.

A Duoplasmatron Ion Source including the electrostatic einzel lens could be purchased as a ready unit from High Voltage Engineering, Burlington. It is air-cooled which limits the arc current to 2 amperes and the correspondent intensity of the ion beam - at operation with hydrogen gas - to 5 ma. The system anode, acceleration electrode, einzel lens is designed for acceleration voltages up to 30 kv.

## 2.2 System Geometry

The geometry of the sputtering source had to be coordinated with the given demensions of the Duoplasmatron.

In order to make the diameter of the focus of the primary ions on the target as small as possible, the location of the target had to be kept as close as possible to the einzel lens. Another point of consideration was that the Duoplasmatron should be mounted having its axis vertical, mainly because of its weight and the necessity to have an

insulating flange between the Duoplasmatron and the other housing, while the axis of the secondary ion beam should be horizontal. This problem was solved by placing a short deflection condenser between the einzel lens and the target which deflects the primary ion beam by  $30^\circ$ , under which angle the beam hits the target surface. The grounded portion of the condenser (see Figure 1) is watercooled, because the entrance opening confines the beam aperture and might get too hot without cooling. An ion current of 5 ma at an energy of 30 kv means a total beam power of 150 watts. The target samples can be attached in the form of flat pieces to an exchangeable heavy copper disc mounted on a water-cooled shaft which can be rotated from outside during operation, the axis being offset from the axis of the secondary ion optics. By this arrangement two advantages are gained. First, a number of different samples can be attached along the proper circumference on the copper disc and brought quickly into the primary ion focus one after the other; second, each single sample can be scanned by slightly rotating the shaft. Scanning of the sample in the direction perpendicular to this movement can be achieved over a limited range by varying the deflection potential of the deflection condenser. The secondary ion optics consists of two cylindrical electrodes, one of which is grounded. The other one is located between this grounded one and the target and serves to focus the secondary ions to the mass spectrometer slit, its potential being adjustable in the neighborhood of the target potential. Attached to this electrode is a  $30^\circ$  piece (comp. Figure 1) with a flat surface facing the exit side of the deflection condenser and bored through to

allow the primary ion beam to pass. This way the retarding field which the primary ion beam has to pass between the condenser exit and the target region is axially symmetrical and cannot distort the beam, and, further, the secondary ion optics is completely shielded against the strong fields of the primary ion optics.

### 2.3 Pumping Requirements

The Duoplasmatron is operated at a pressure of about 20 microns. The ion extraction orifice in the anode is a bore of 0.2 mm diameter. In case the Duoplasmatron is operated with Argon, the effusive flow out of this orifice would be  $3 \cdot 10^{15}$  particles/second, according to Knudsen's equation. An ion current of 5 ma consisting of singly charged ions corresponds to  $3 \cdot 10^{16}$  particles/second, which is ten times as much. That means the pumping requirements have to be based on this figure. The pressure which builds up in the region between the Duoplasmatron and the mass spectrometer slit is given by the relation

$$n \text{ [particles/sec]} = s \text{ [cm}^3\text{/sec]} \times N \text{ [particles/cm}^3\text{]}$$

where  $s$  is the pumping speed working at that volume and  $N$  is the resulting number density. From this it follows that in order to keep the background pressure below  $10^{-5}$  torr, a pumping speed of 10 liters/second is required.

The system is mounted directly on the pumping port of a Veeco VE-400 pumping station, which is equipped with a 400 liters/second oil diffusion pump and has at the pumping port a pumping speed of about 100 liters/second.

That means that the background pressure will be around  $10^{-6}$  torr when the Duoplasmatron is operated with Argon. For heavier gases than Argon, for instance Krypton or Xenon, the background pressure would get higher, because the pumping speed for those gases is lower.

### 3. Technical Description

#### 3.1 Housing

The main housing of the Sputtering Ion Source consists of a 4-1/2" stainless steel tube with two end flanges and five flanged sideports. The upper sideport carries the high voltage feed-through which puts the middle electrode of the einzel lens on high potential. At the second sideport, the deflection condenser is inserted. At the third sideport the target holder and the secondary ion optics are mounted. The fourth sideport opposite to it is the connection port to the mass spectrometer. The fifth sideport is a viewing port. The five sideports and the two end flanges are heliarc welded to the 4-1/2" housing tube. The feed-throughs which are of the ceramic-metal type are vacuum brazed into their correspondent flanges. The bottom end flange sits on the 4" pumping port of the pumping station, and the top end flange carries an insulating flange machined of pyrex. This in turn carries the Duoplasmatron Ion Source which is kept at high potential.

#### 3.2 Duoplasmatron

The principal elements of the Duoplasmatron are a filament, a baffle electrode, a source-aperture plate (anode), a magnet, and a housing. The filament, a platinum-gauze coated with barium oxide, is mounted across the ends of two rods which are connected to the filament power supply through ceramic-metal feed-throughs which lead through the cover of the source. The source baffle surrounds the filament. It is

insulated from the anode plate by a ceramic ring and connected over a bleeder resistor to the anode plate which results in a baffle potential about in the middle between the filament and the anode plate. The bottom of the baffle is conically shaped with a hole at its apex. Facing the apex of the cone, and separated from it by a small gap, is the aperture plate which has a hole of 0.008 inch in its center. A solenoid surrounds the source baffle which creates a strong magnetic field between the apex of the source baffle and the aperture plate. An exhaust fan, mounted on top of the Duoplasmatron, cools the magnet and the source assembly.

### 3.3 Gas Supply

The gas is supplied through a 1/8" copper tube which leads through the source cover. A needle valve controls the flow of the gas out of one of the two supply flasks, where the gas is stored at a pressure of about 50 torr. This gas inlet system is electrically insulated for 30 kv against ground, because during operation it will be on the high voltage side.

### 3.4 Einzel Lens

The einzel lens consists of three stainless steel electrodes. It extracts the positive ions from the plasma at the source aperture and brings them into focus at a distance which is adjustable by choosing the proper potential of the middle electrode.

The first electrode (the extraction electrode) has a cone-shaped apex at the upper end which creates a strong electric field between the hole in the source aperture plate and the bored apex, and thus extracts and accelerates the ions into the einzel lens. The first and third electrodes are interconnected and grounded, while the middle electrode is kept at a potential a few kilo volts below the potential of the Duoplasmatron. The einzel lens assembly is mounted with three long rods to the source aperture plate. Ceramic spheres maintain proper insulation and spacing between the electrodes.

### 3.5 Deflection Condenser

The deflection condenser consists of a trapezoid shaped grounded copper block to which two aperture plates are attached, and a deflection plate at a proper potential to deflect the primary ion beam by  $30^\circ$ . The copper block has a center bore and slips over a water-cooled copper tube passing through the mounting flange. This flange carries also the high voltage feed-through for the deflection plate which is mounted directly on the center rod of the feed-through. The two aperture plates are easily replaceable. The condenser plates are tilted by  $15^\circ$  against the axis of the einzel lens so that the position of the condenser is symmetrical in respect to the path of the primary ion beam. Assuming the energy spread of the primary ions being less than 0.1%, which is the case with the Duoplasmatron at acceleration voltages over 20 kv, the broadening of the beam at the target surface due to the energy dispersion of the deflection condenser turns out to

be less than .002" and is therefore negligible.

### 3.6 Target Holder

The target samples are to be attached to a copper disc which in turn is bolted to another copper disc which is mounted on a water-cooled copper tube. This tube goes through the cover flange, being electrically insulated against it, and vacuum sealed with two spring loaded gaskets, whereby the space between them is kept under fore-vacuum. A retainer ring with an engraved degree scale located on the tube behind the cover flange allows movements of the target samples in a controlled way.

### 3.7 Secondary Ion Optics

Between the target cover flange and the respective sideport there is another flange on which two tube shaped copper electrodes are mounted which serve to accelerate and focus the secondary ions. They are mounted in a similar manner as the elements of the einzel lens, filed up on four rods and one of the electrodes insulated and held in place with pyrex balls. A ceramic-metal feed-through supplies the voltage for the insulated electrode, which has an angle piece attached to its upper side with a passage for the primary ion beam. At present the mass spectrometer connection port opposite to the target holder port is closed with a flange carrying a collector to measure the total secondary ion current.



### 3.8 Viewing Port

A viewing port consisting of a 1/4" thick pyrex disc, gasketed between two aluminum flanges, allows visual observation of the target region. The pyrex disc can be easily replaced which is expected to be necessary from time to time whenever the inner glass surface gets blackened by sputtered material.

### 3.9 Power Supplies

The power supply unit for the Duoplasmatron includes a filament transformer rated for 0 to 4 volts, 0 to 18 amperes, a.c., an arc power supply rated for 0 to 220 volts, 0 to 2 amperes d. c., and a magnet power supply, rated for 0 to 120 volts, 0 to 2 amperes d. c. All these power supplies including instruments and variacs are insulated against ground for at least 30 kv and obtain their input power from an insulating transformer, which transforms 115 volts a. c. at a ratio of 1:1 with a rating up to 1500 volt ampere.

The high voltage power supply for the acceleration and focusing of the primary ion beam is rated for 0 to 50 kv, 0 to 30 ma d. c. The negative terminal is grounded, the positive terminal is connected over a protection resistor to the Duoplasmatron aperture plate. The voltages for the einzel lens middle electrode and for the deflection condenser are taken from a voltage divider across the Duoplasmatron aperture plate and ground and can be varied in small steps to adjust the focus on the target. The middle electrode of the einzel lens draws

about three to four times as much current as the primary ion beam amounts to, due to secondary electrons which are liberated by primary ions. Therefore, the voltage for this electrode is applied over a high voltage tube in a cathode follower circuitry. This arrangement guarantees stability of the primary ion beam despite ripple and fluctuations of the acceleration voltage.

#### 4. Conclusion

An ion source for solids analysis has been designed and built which uses the principle of sputtering of secondary ions from a sample surface which is bombarded by highly energetic primary ions.

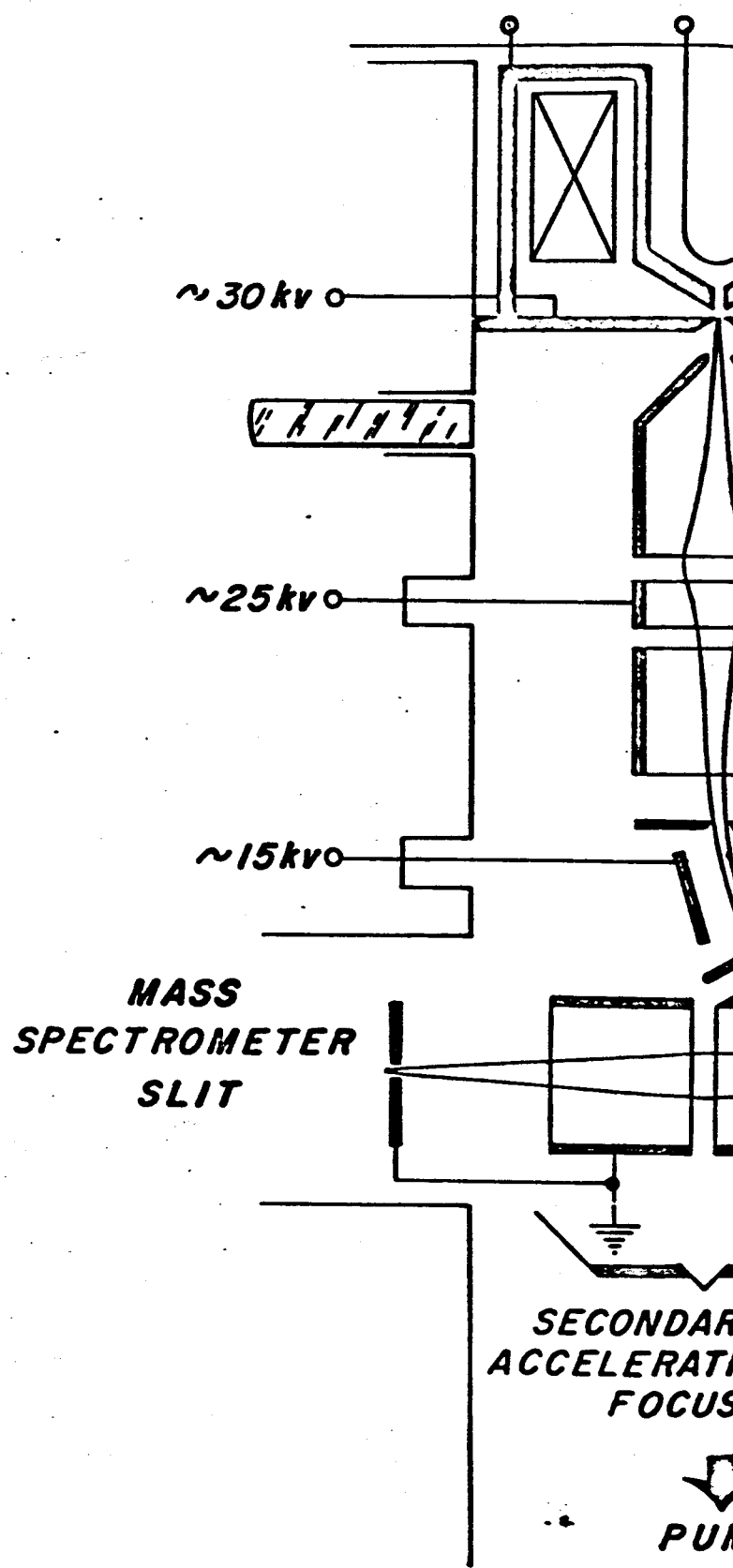
The primary ions are produced in a Duoplasmatron Ion Source which delivers a homogenous beam of positive ions at an intensity of several milliamperes. Ions of various kinds of gases or vapors can be produced in the Duoplasmatron. It is expected that noble gases will give the highest yield of sputtered secondary ions.

The primary ions can be accelerated to energies up to 30 kilovolts. They are brought to focus on the target, the diameter of the focus being variable between 0.5 mm up to at least 5 mm. The target samples are to be attached in the form of tablets to a water-cooled copper plate, and can be scanned with the primary ion focus in two directions. The secondary ions are accelerated and focused on the mass spectrometer slit.

The performance of the new ion source has not yet been tested.

REFERENCES

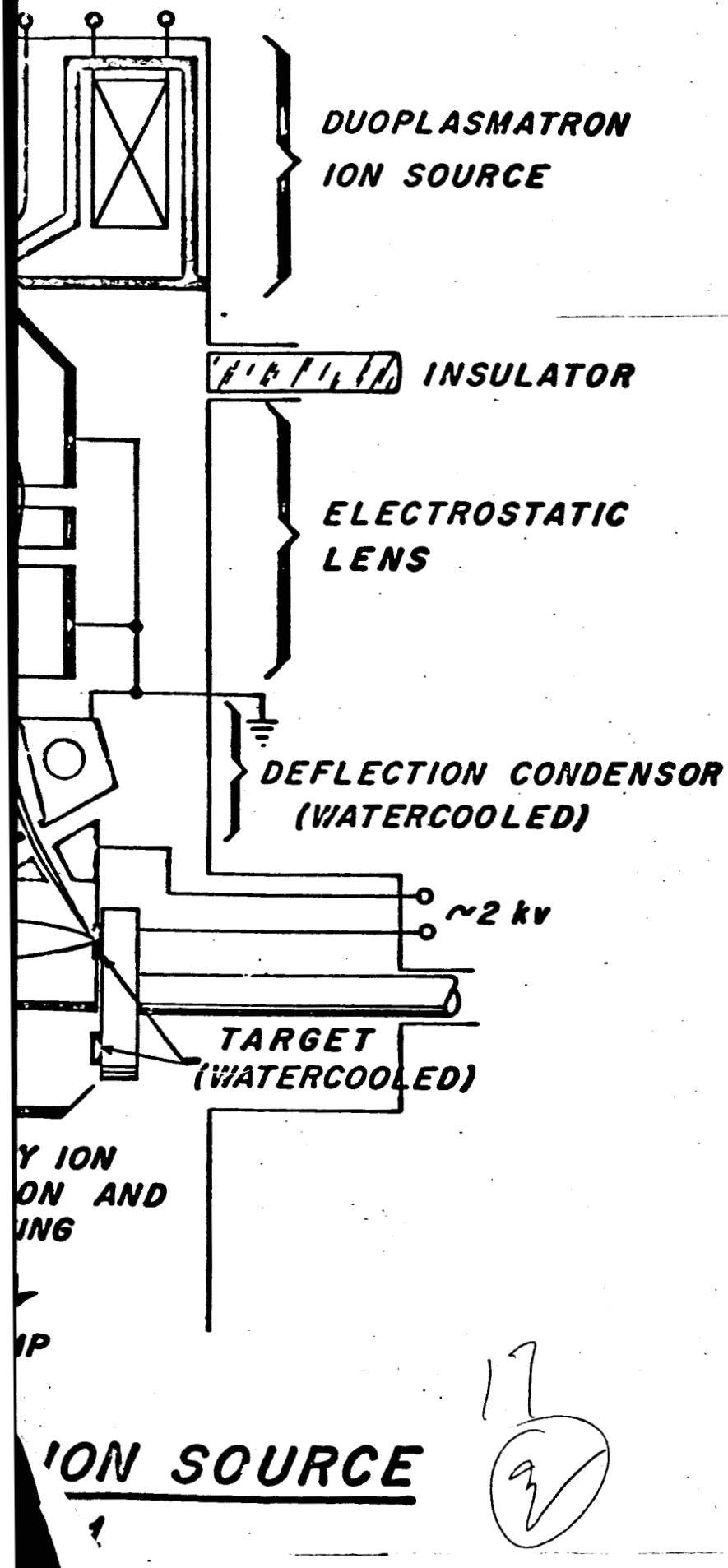
1. Herzog, R. K. F. and Viehbok, F. P.; PHYS. REV. 76, 855 (1949)
2. Ardenne, M. V.; TABELLEN DER ELEKTRONENPHYSIK, IONENPHYSIK UND UEBERMIKROSKOPIE, Vol. I, pg. 544
3. Frohlich, H.; NUKLEONIK I, 183 (1959)
4. Pitkin, E. T.; SPUTTERING DUE TO HIGH VELOCITY ION BOMBARDMENT, IN ELECTROSTATIC PROPULSION, Pg. 195



**SPUTTERING**

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FIGURE



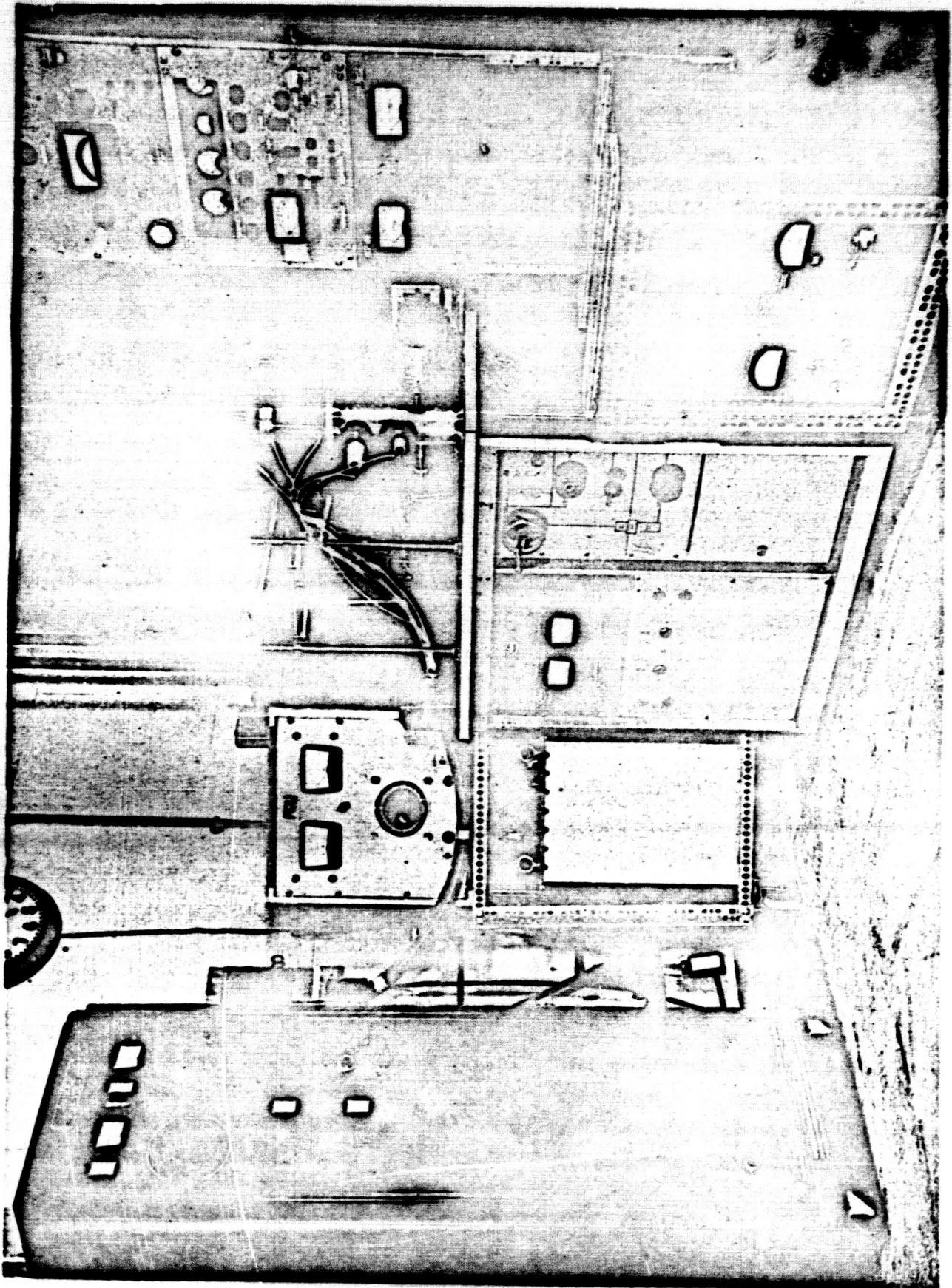


Figure 2. Overall View of the Test Setup

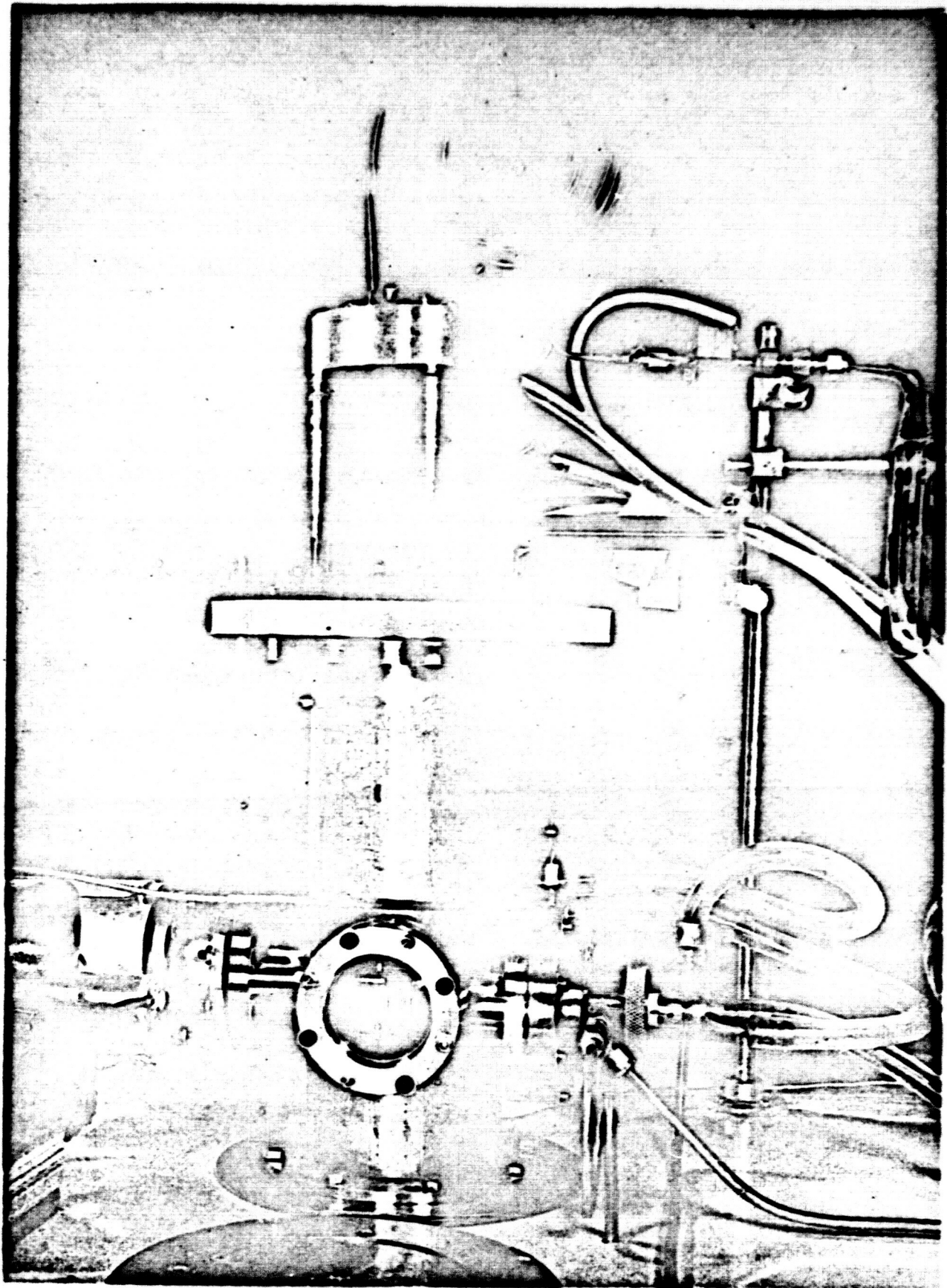


Figure 3. Sputtering Ion Source, Front View



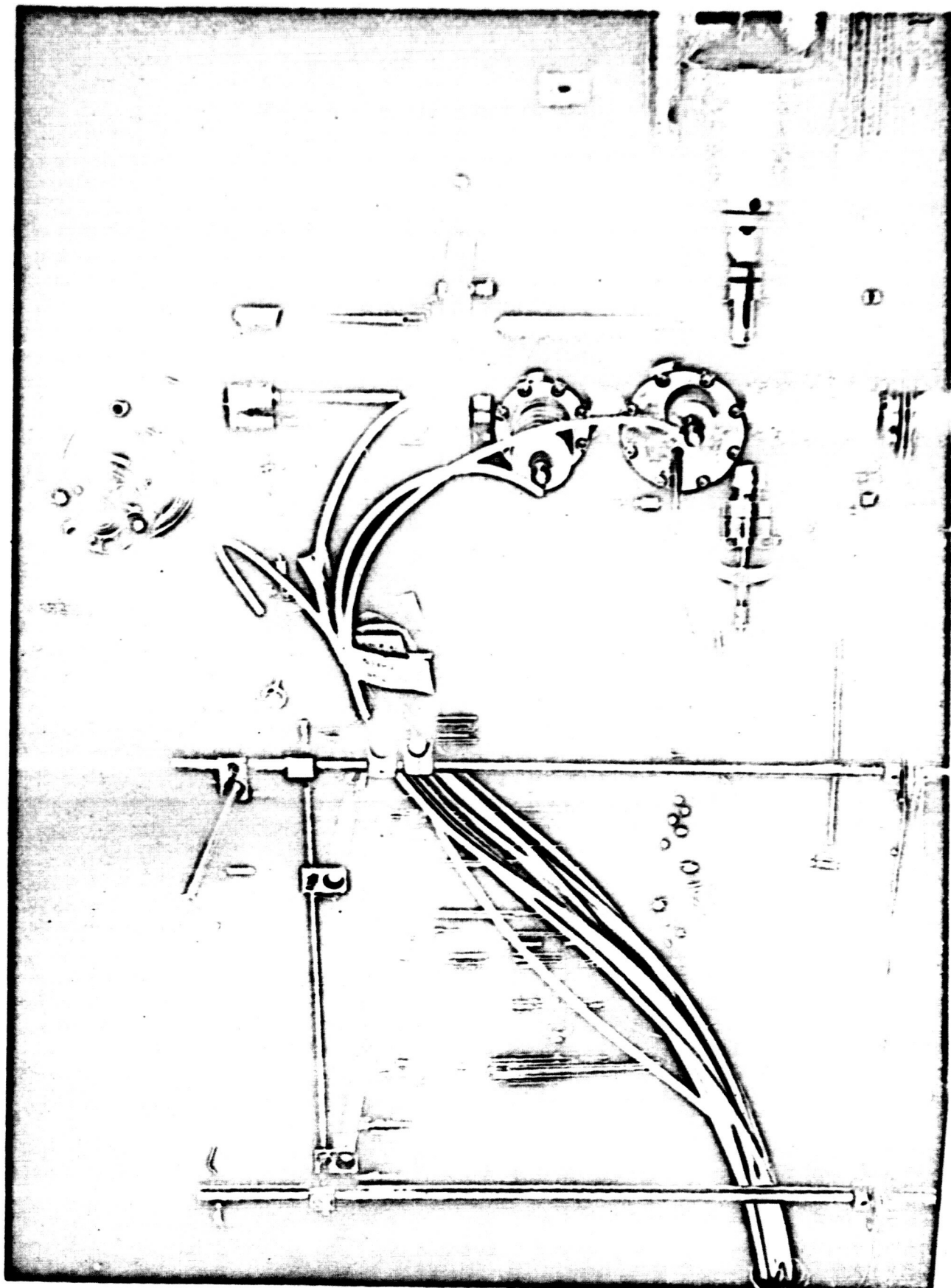


Figure 4. Sputtering Ion Source, Back View

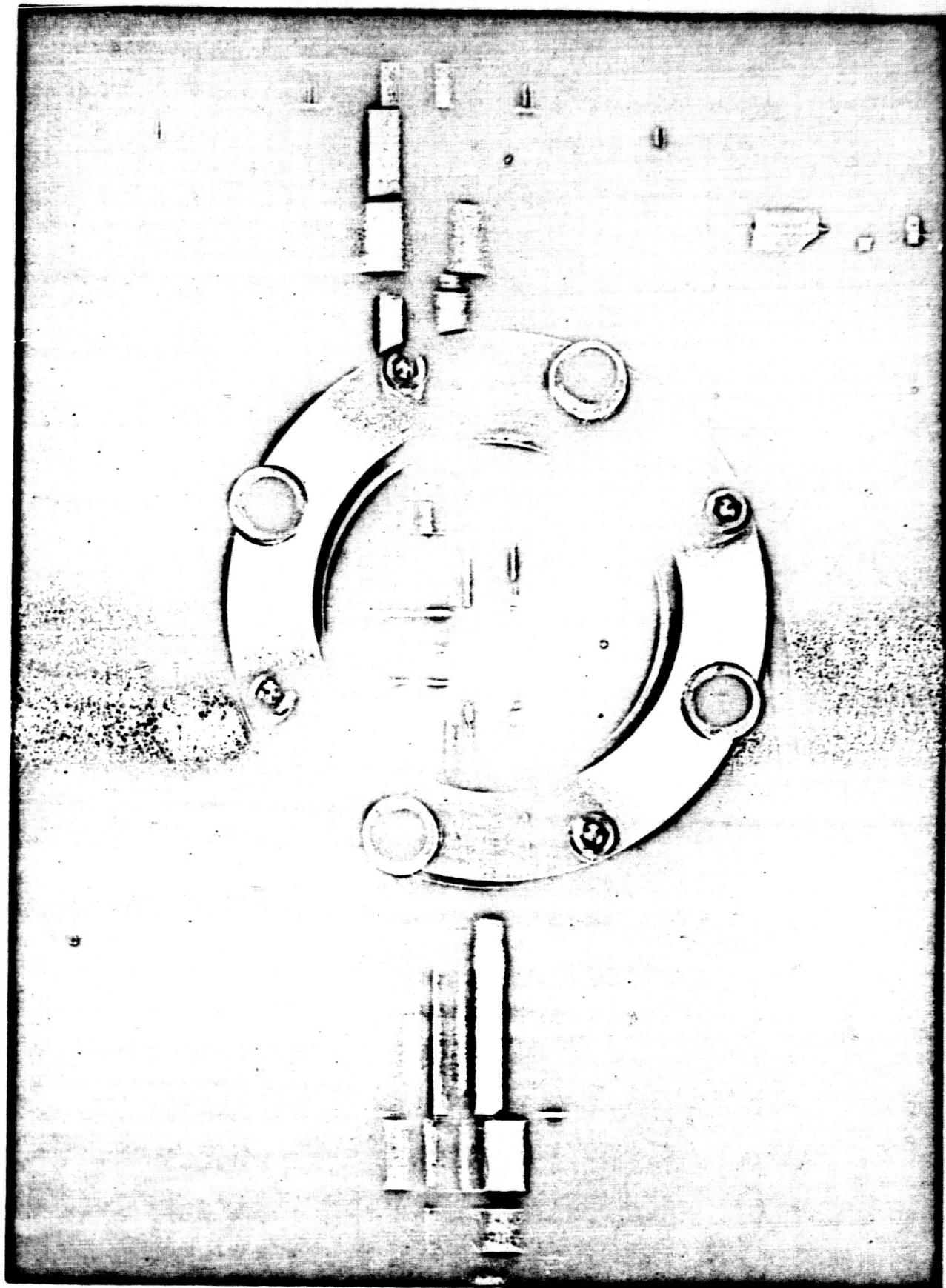
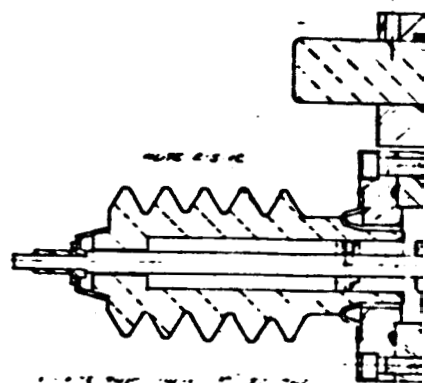
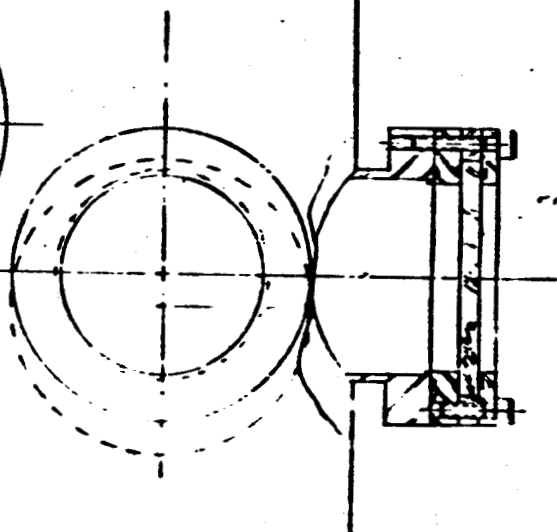
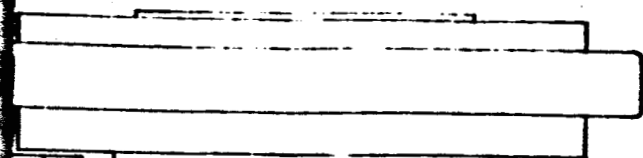
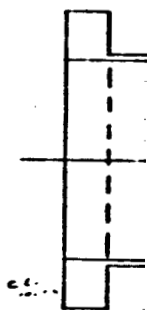


Figure 5. View Through Window to Sample Target and Secondary Ion Lens

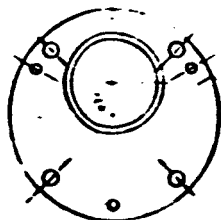
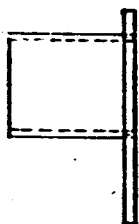
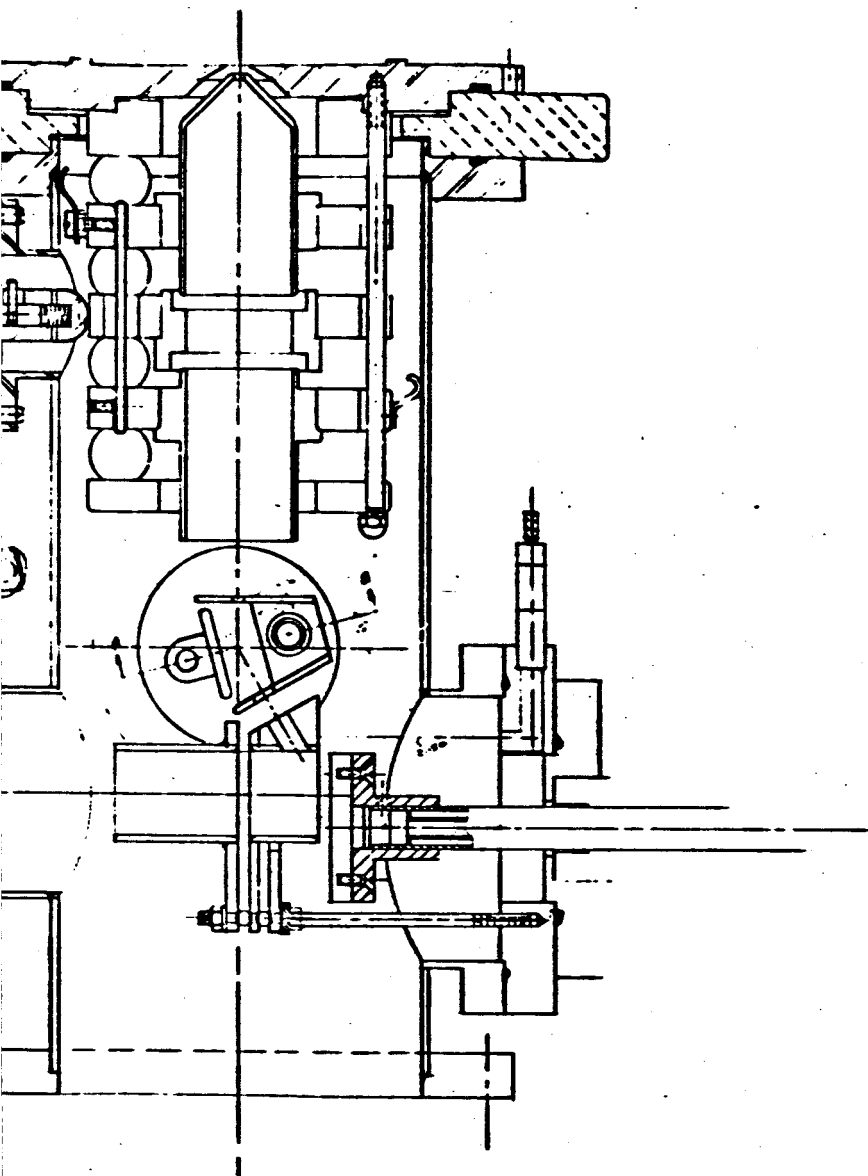




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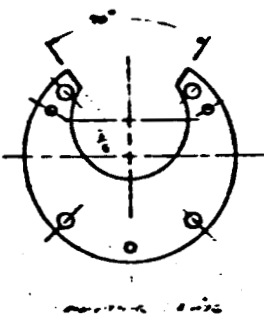
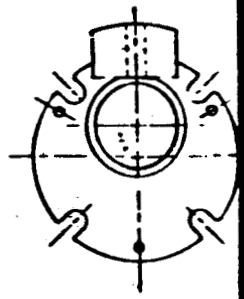
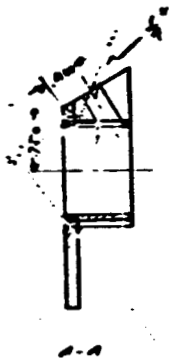
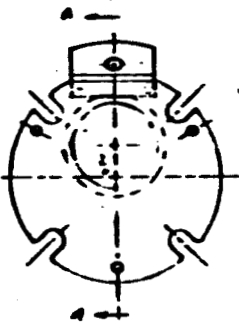
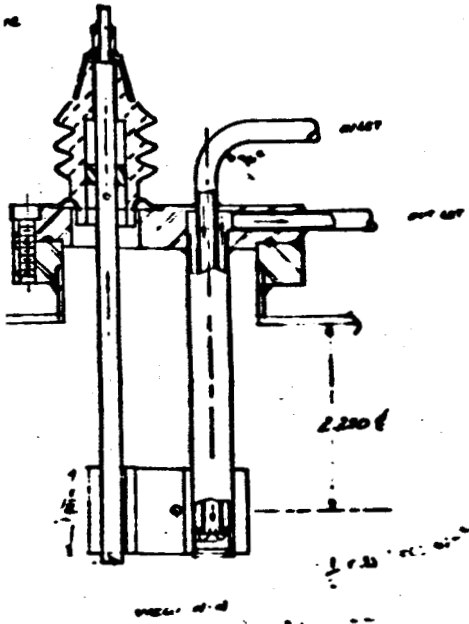


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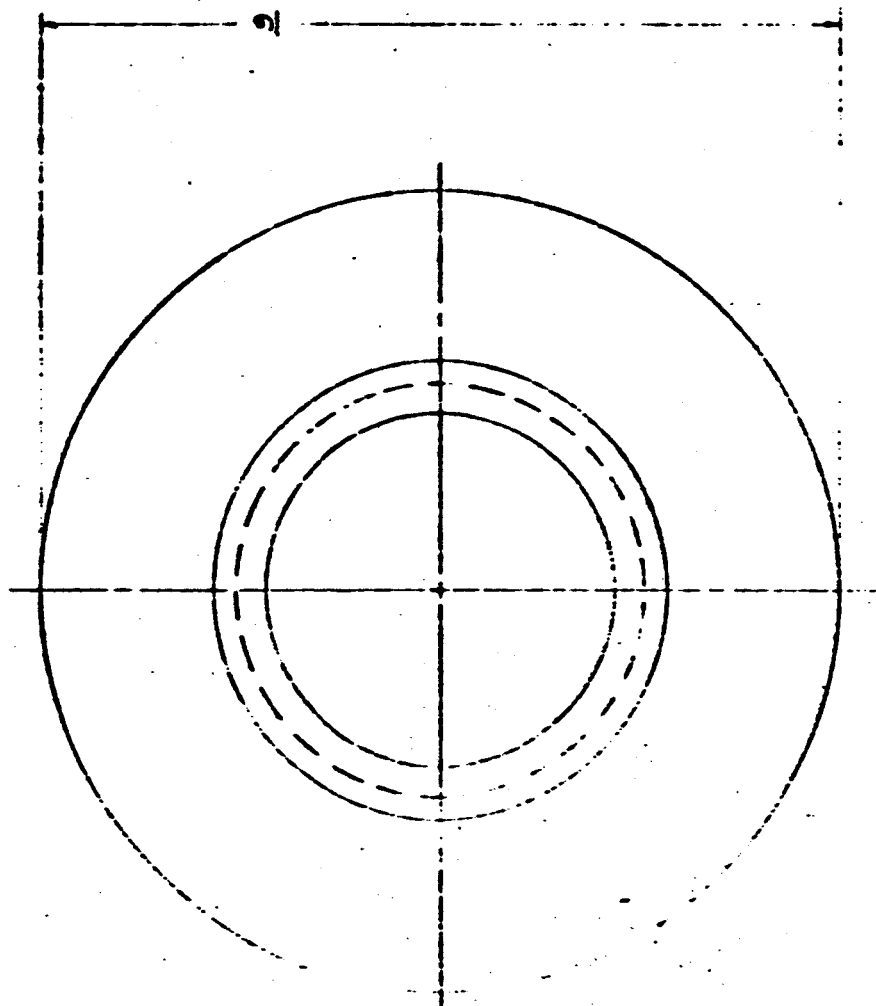
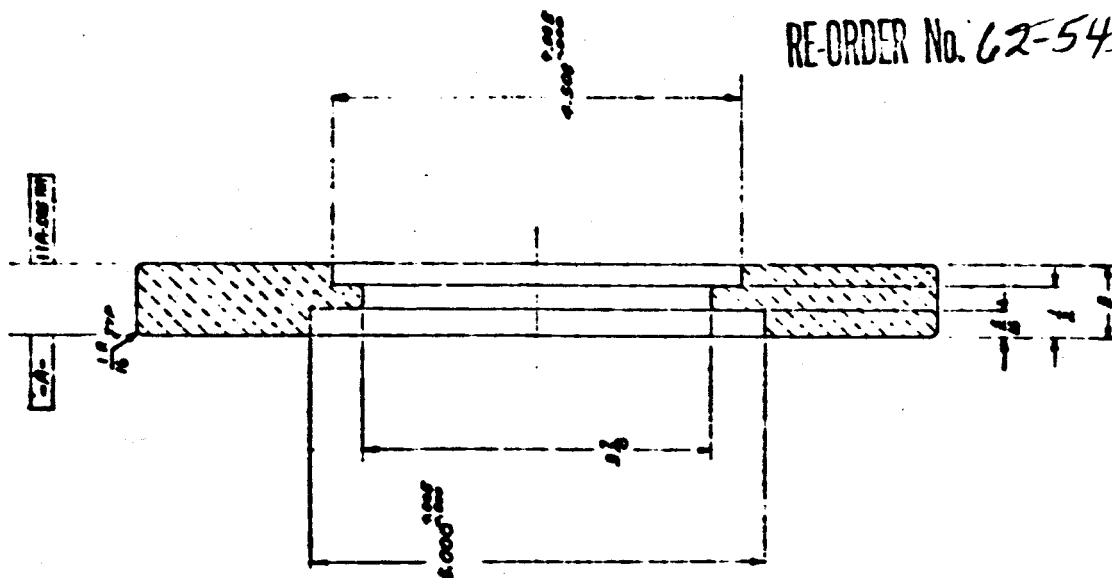
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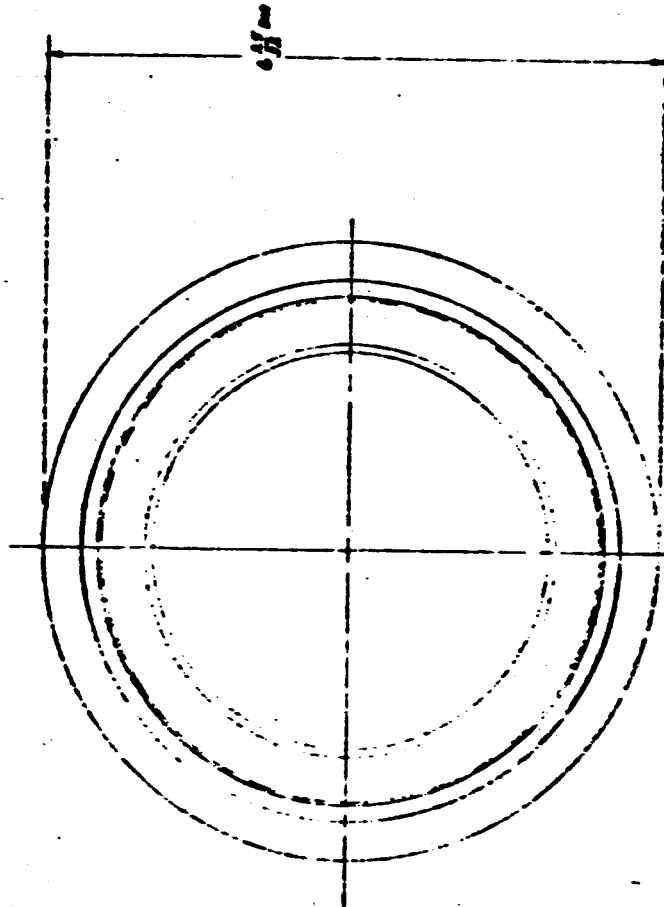
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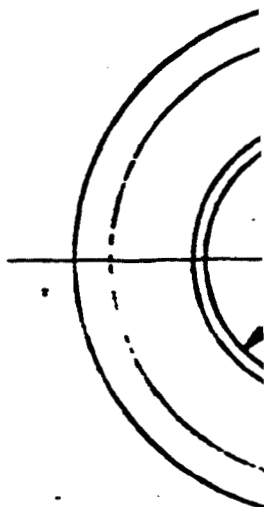
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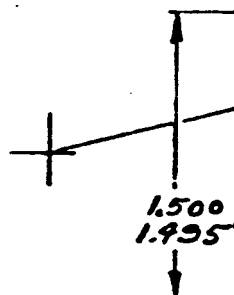
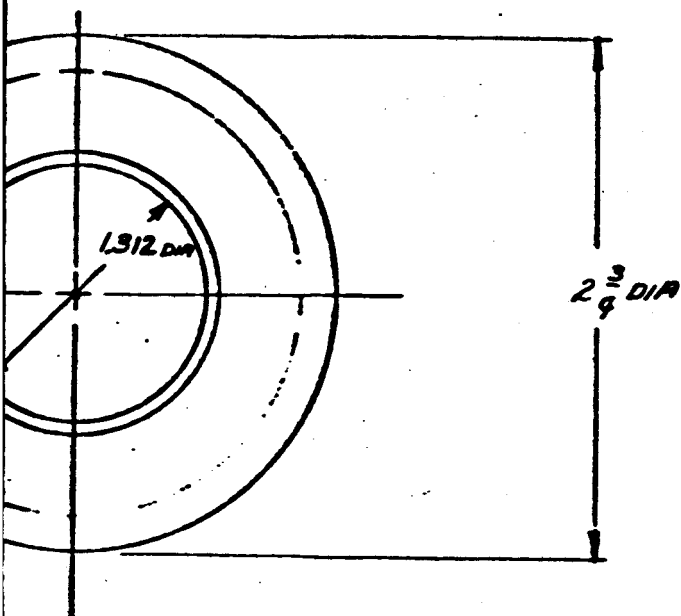
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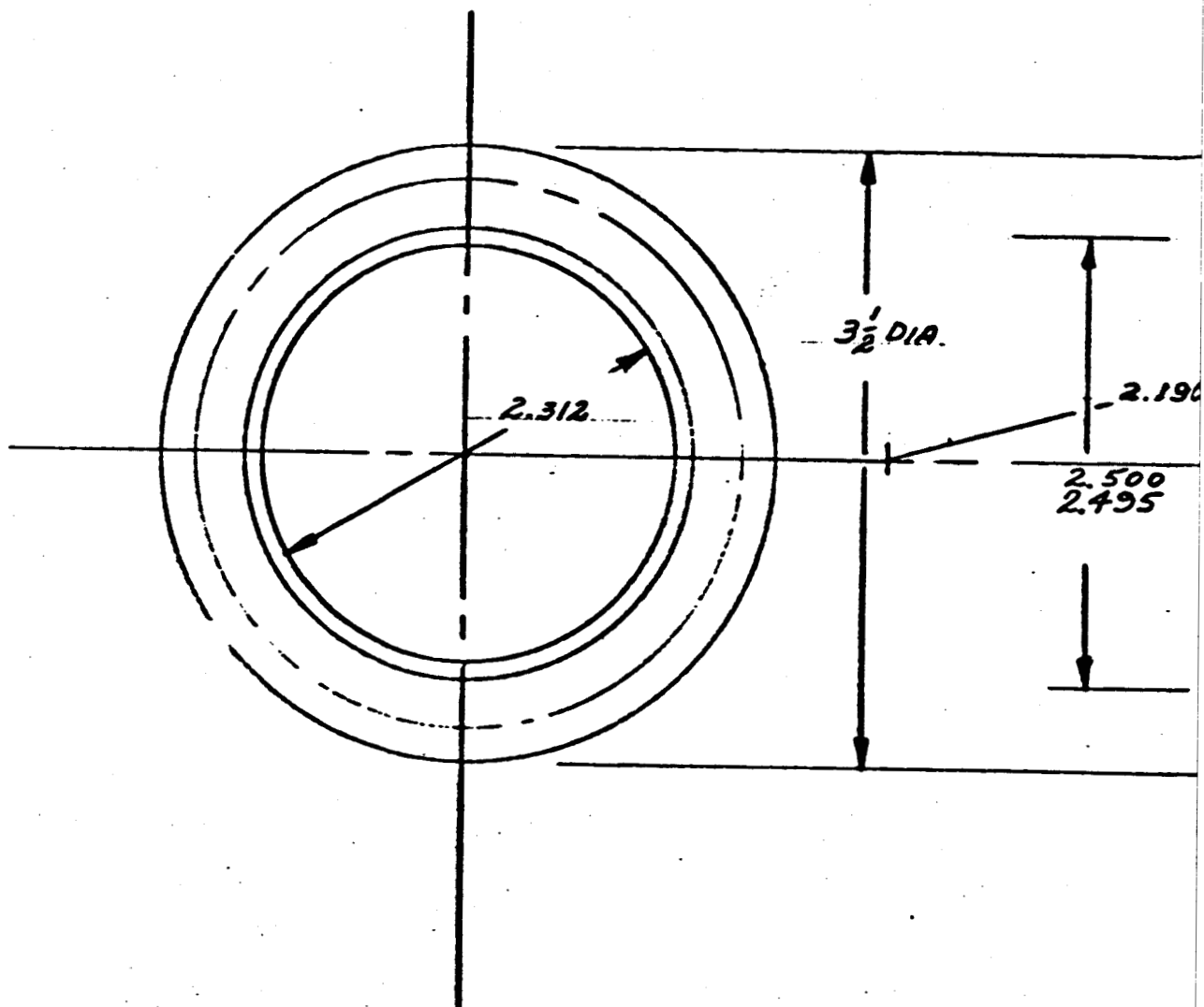
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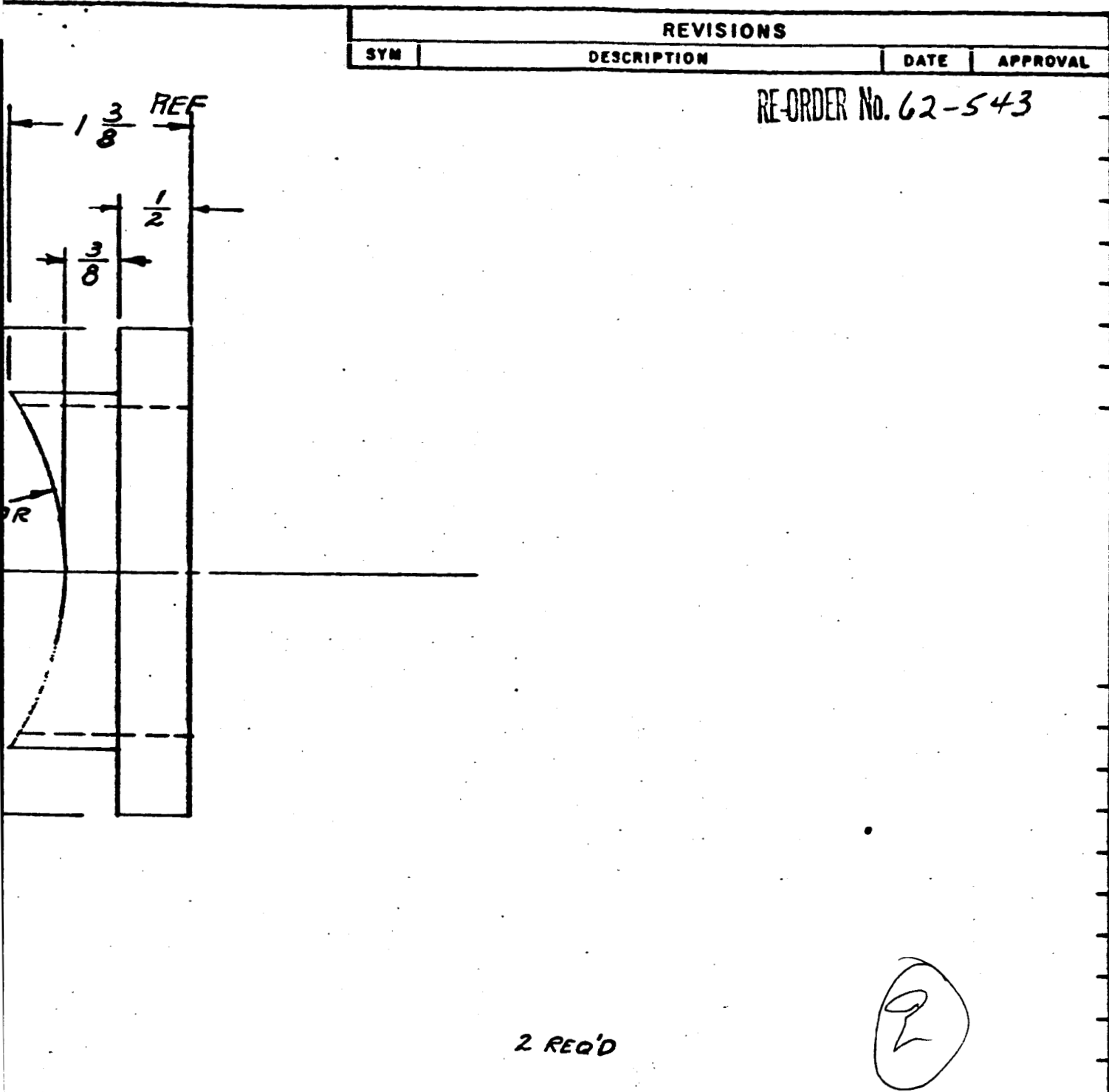
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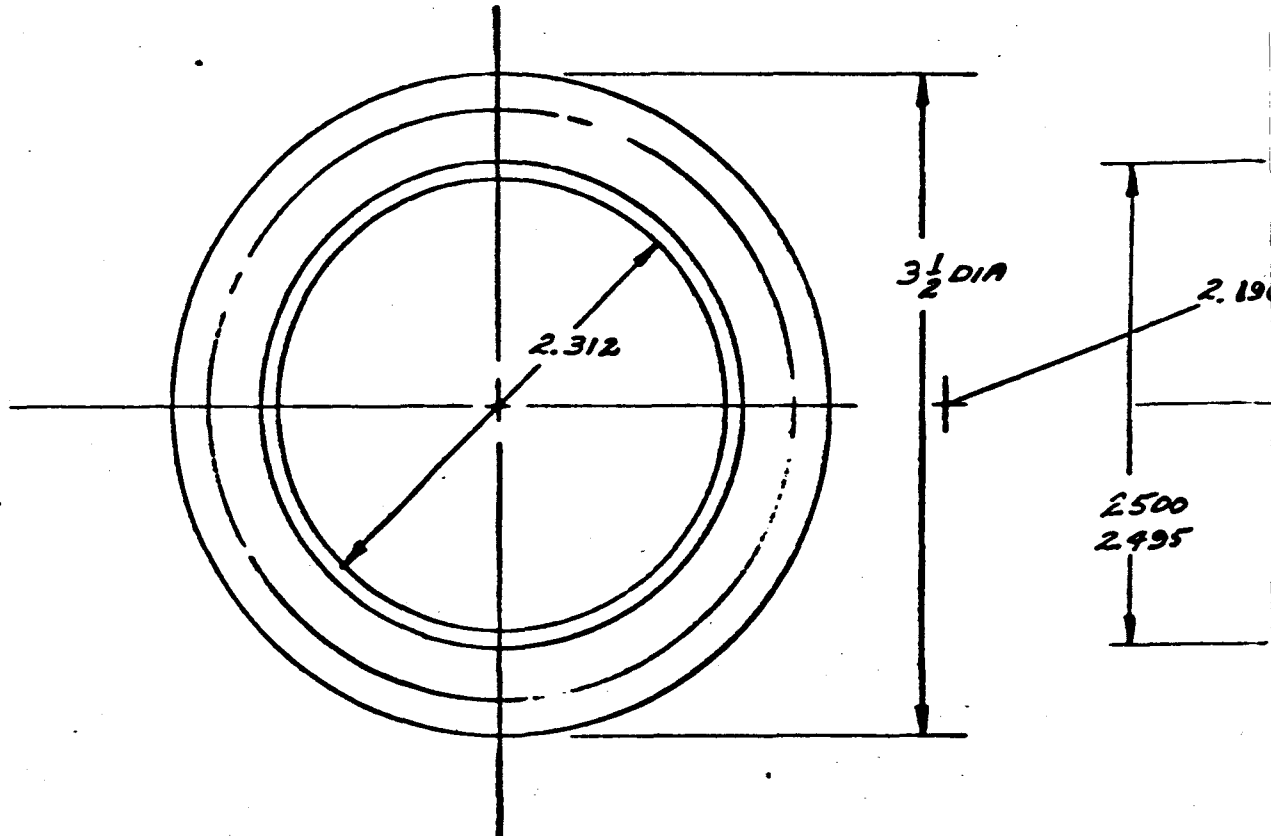
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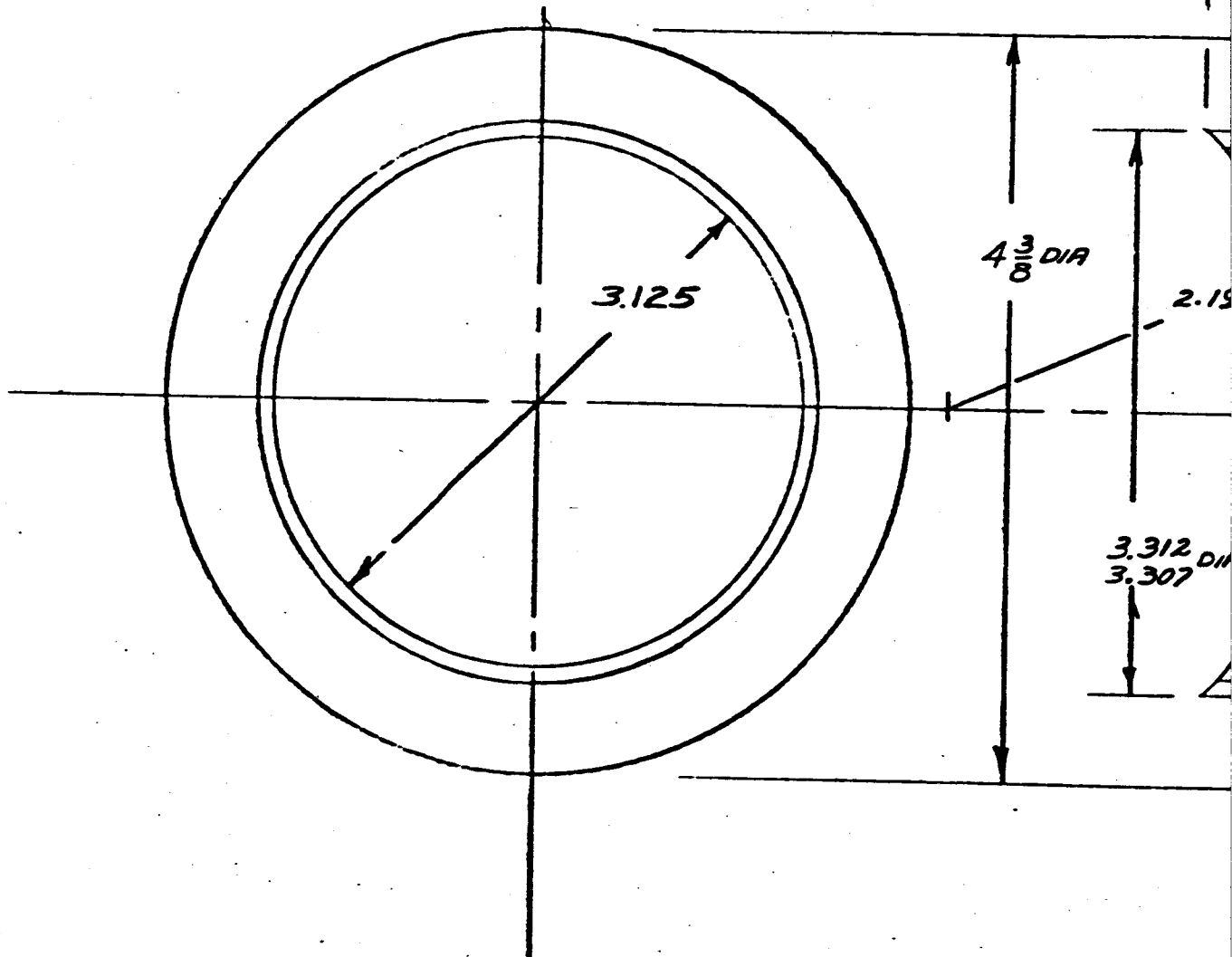


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NEXT ASSY	USED ON	
APPLICATION		

2801



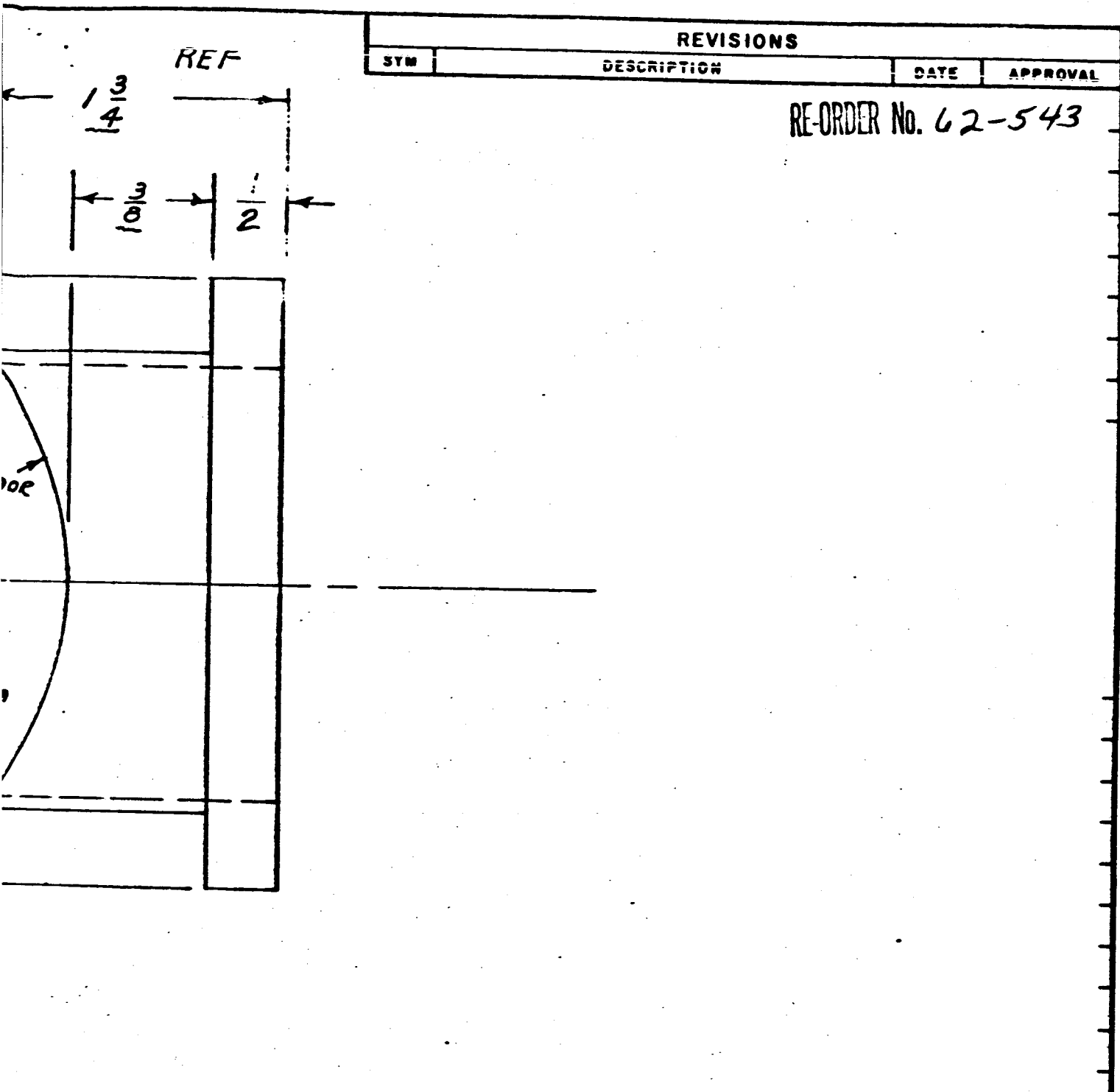
NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.




		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON $\pm$
		FRACTIONS $\frac{1}{4}$ DECIMALS .005 ANGLES $\frac{1}{8}$
		MACHINE FINISH $\sqrt{3}$
		MATERIAL
		304 STAINLESS ST'L
		HEAT TREATMENT
		$\sqrt{H}$
		FINAL FINISH
		$\sqrt{H}$
NEXT ASSY	USED ON	
APPLICATION		

290





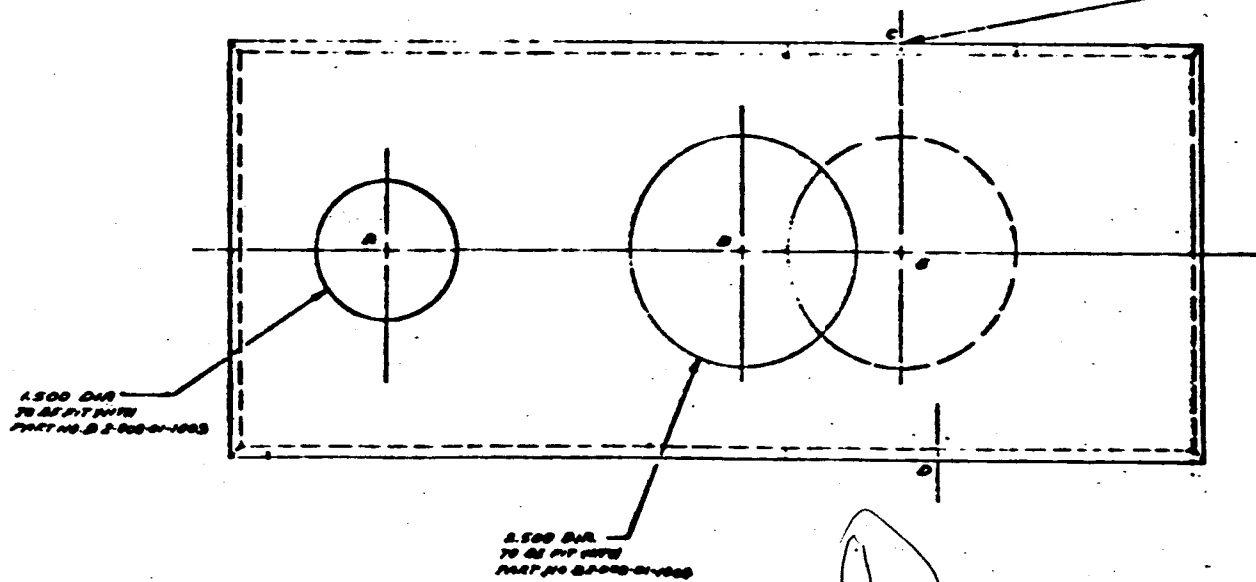
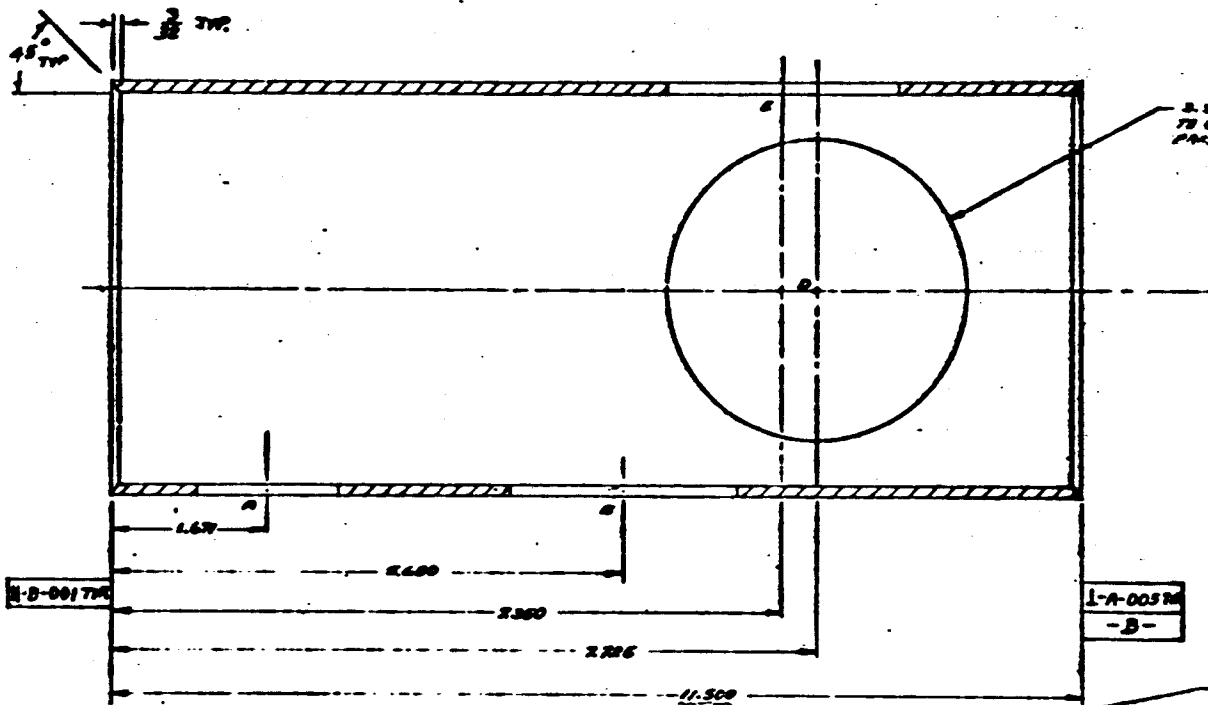
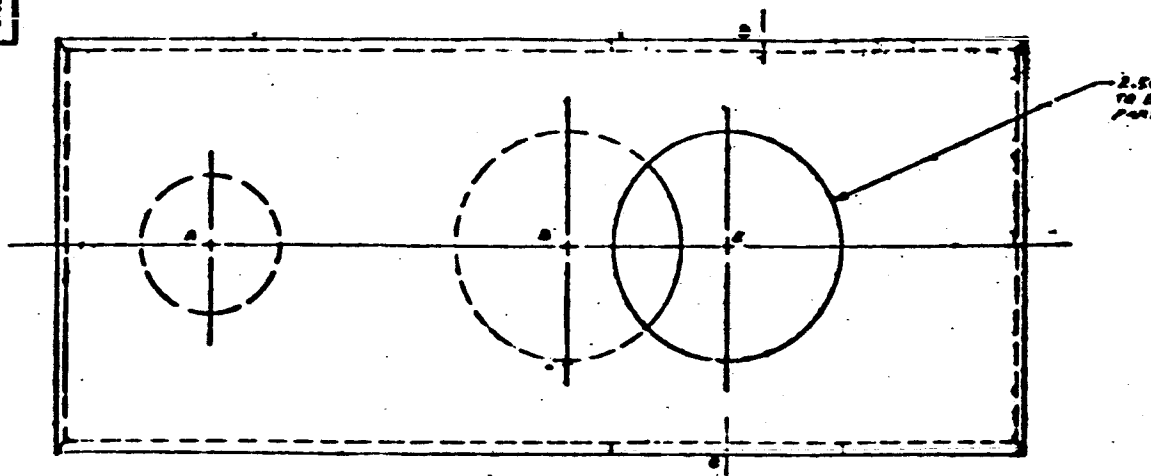
M - MINNEAPOLIS  
L - LINCOLN  
B - BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
<b>LIST OF MATERIAL</b>					
GEOPHYSICS CORPORATION OF AMERICA DR <i>9-22-61</i> CHK <i>10-11-61</i> APP APP APP		<b>PORT FLANGE</b> <b>(3 1/8 DIA)</b>	 <b>GEOPHYSICS CORPORATION OF AMERICA</b>		
			DRAWING NUMBER <b>2-008-01-1006</b>		
SCALE <b>1:1</b>		LOC <b>B</b>	SIZE <b>B</b>	SH. / OF /	REV <b>0</b>

CLASSIFICATION:

*2*

1. This drawing is a technical drawing of a mechanical part.  
 2. It is a top view of the part.  
 3. The part is rectangular with a central hole.  
 4. The hole is circular with a diameter of 1.500.  
 5. The part is made of steel.  
 6. The part is part of a larger assembly.  
 7. The part is identified by the number 1-A-005M.  
 8. The part is identified by the number -B-.



300

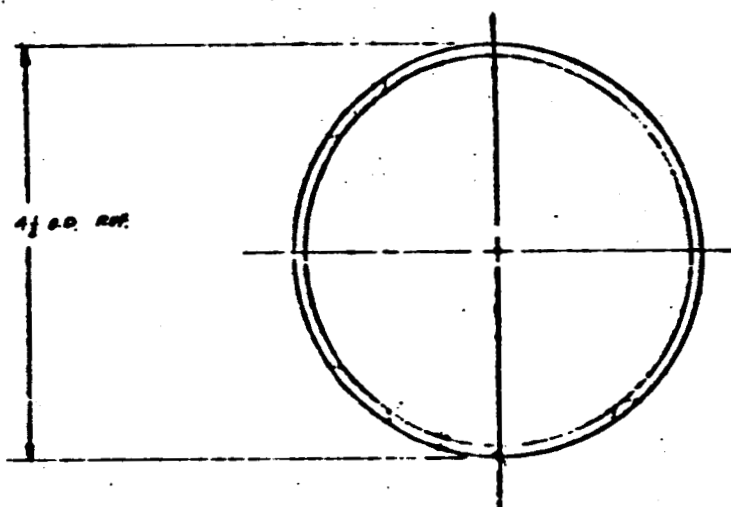
REVISIONS			
REV	DESCRIPTION	DATE	APPROVAL
1	ADDED TOL DIMENS CHANGES FOR CHANGES.	11-10-61	

RE-ORDER No. 62-543

DATE:  
FRT WITH  
NO. 2-008-01-1000

DATE:  
FRT WITH  
NO. 2-008-01-1000

-A-



NOTE: ALL FITS TO BE A  
LIGHT HAND PRESS

DATE:  
FRT WITH  
NO. 2-008-01-1000

ITEM NO.	PART NO.	DESCRIPTION	DATE	DATE SPEC	STOCK
LIST OF MATERIAL					
GEOPHYSICS CORPORATION OF AMERICA			GEOPHYSICS CORPORATION OF AMERICA		
DB	11-11-61	11-11-61			
LC-8	11-11-61	11-11-61			
QPP					
QPP					
QPP					
HOUSING					
1:1			2-008-01-1000		
DATE 1:1			DATE 1:1		

ITEM NO.	PART NO.	DESCRIPTION	DATE	DATE SPEC	STOCK
LIST OF MATERIAL					
GEOPHYSICS CORPORATION OF AMERICA			GEOPHYSICS CORPORATION OF AMERICA		
DB	11-11-61	11-11-61			
LC-8	11-11-61	11-11-61			
QPP					
QPP					
QPP					
HOUSING					
1:1			2-008-01-1000		
DATE 1:1			DATE 1:1		

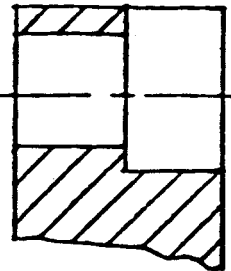
BLACK-BOARD:



DIMENSIONS IN INCHES - DO NOT SCALE PRINT

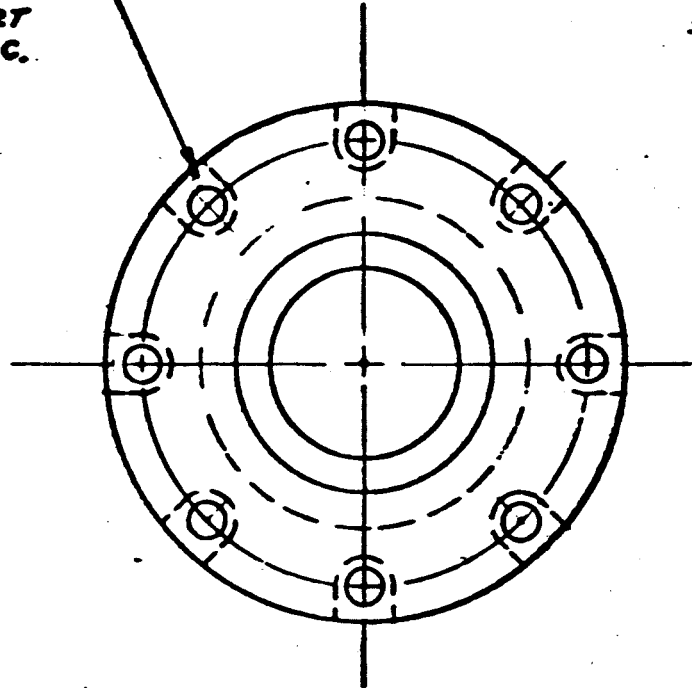
NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY FOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONFERRING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

200



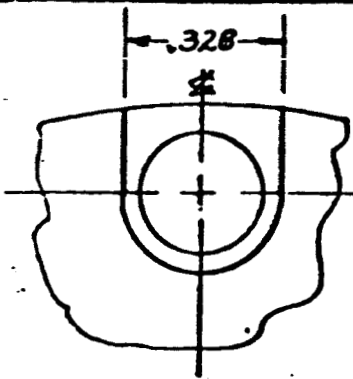
DETAIL  
# SLG  
SCALE

DRILL NO.4(.202)  
8 HOLES EQUALLY  
SPACED 45° APART  
ON A 2.375 DIA B.C.



		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH $\sqrt{3}$
		MATERIAL
		304 STAINLESS ST'L
		HEAT TREATMENT
		#
		FINAL FINISH
		#
NEXT ASSY	USED ON	
APPLICATION		

310



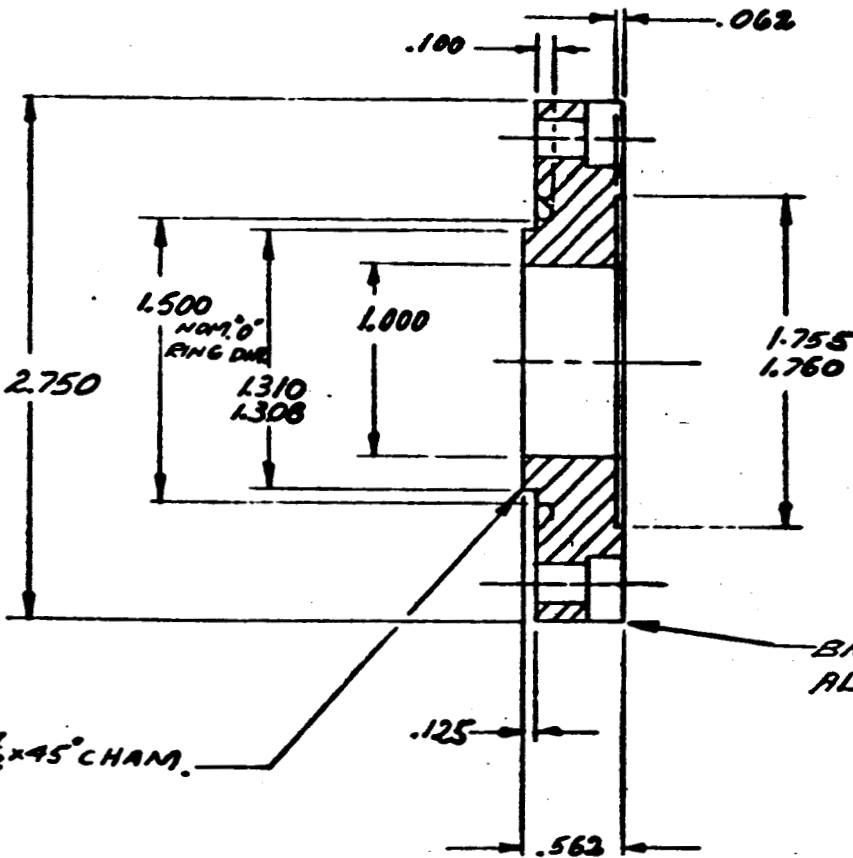
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543

M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD



BREAK EDGES  
ALL AROUND

1/32 x 45° CHAM.

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
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### LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA	
WFA	9-29-61
AK	10-11-61
PP	
PP	
PP	

MOUNTING PLATE  
(ALITE 2-5-1C)



GEOPHYSICS  
CORPORATION  
OF AMERICA

DRAWING NUMBER

2-008-01-1008

SCALE 1:1

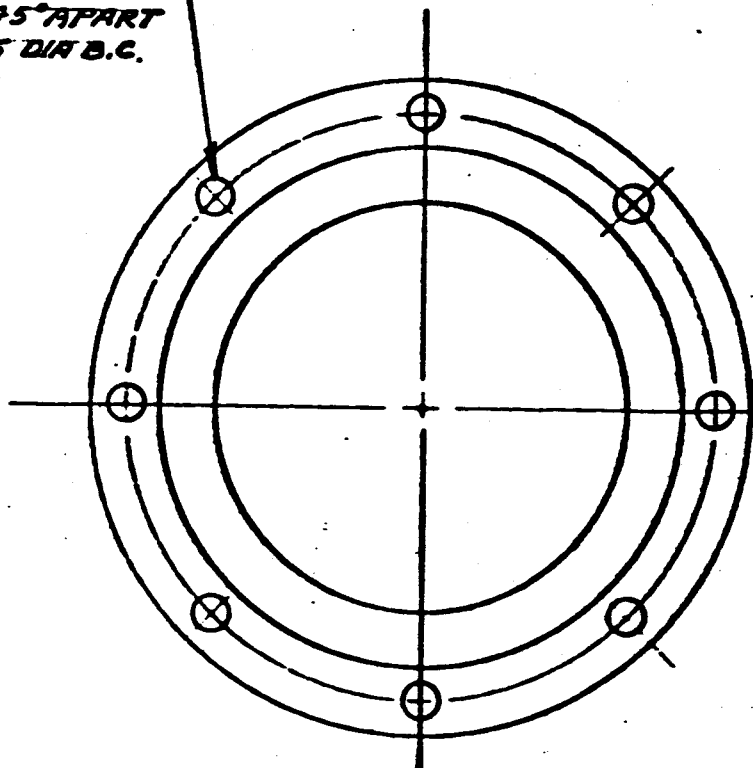
LOC B SIZE B SH. 1 OF 1 REV 0

CLASSIFICATION:

2

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY FOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THEREBY.

DRILL NO. 8 (.209)  
8 HOLES - EQUALLY  
SPACED 45° APART  
ON A 3.125 DIA B.C.

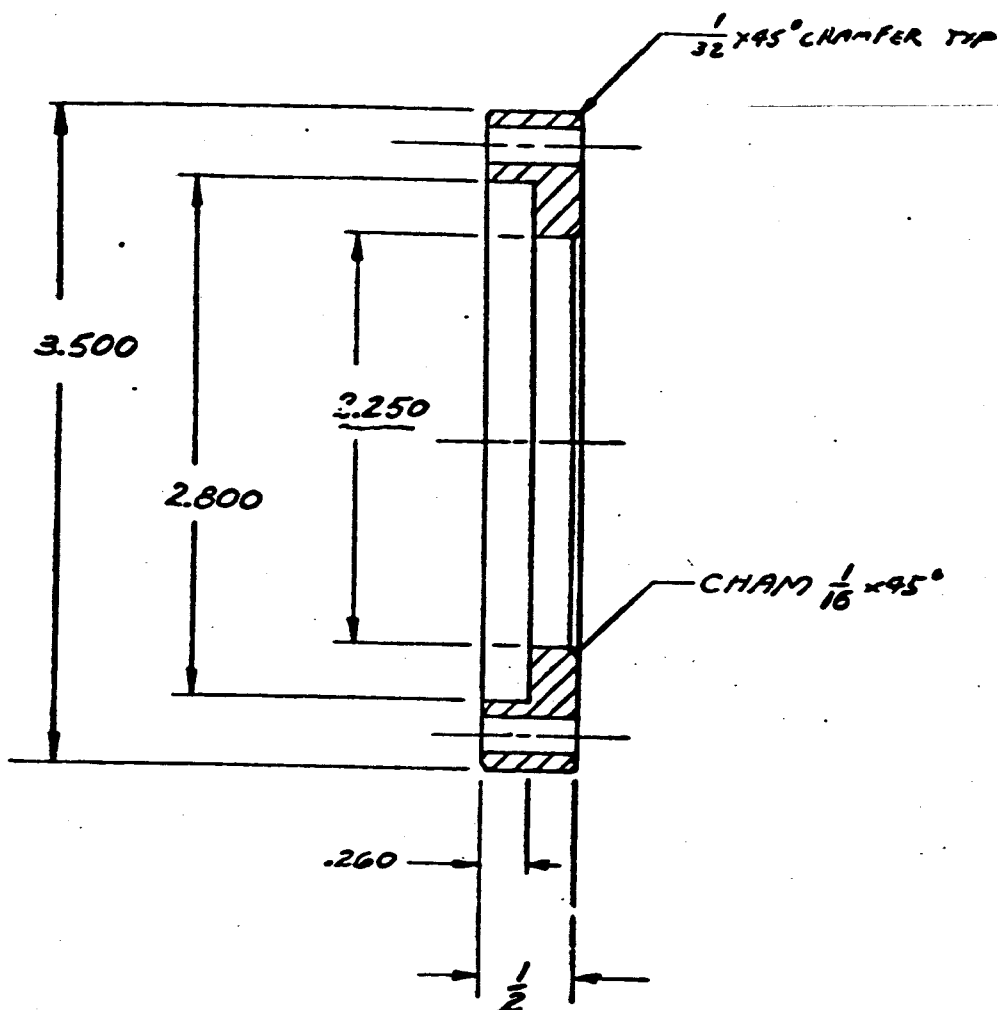


		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{16}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH
		MATERIAL
		ALUM
NEXT ASSY	USED ON	HEAT TREATMENT
APPLICATION		#
		FINAL FINISH
		#

270

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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### LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		
DR	WFA	9-29-61
CHK	WFA	10-11-61
APP		
APP		
APP		

PLATE-TOP,  
VIEWING PORT



GEOPHYSICS CORPORATION OF AMERICA

DRAWING NUMBER

2-008-01-1009

SCALE 1:1

LOC B SIZE B SH. 1 OF 1 REV 0

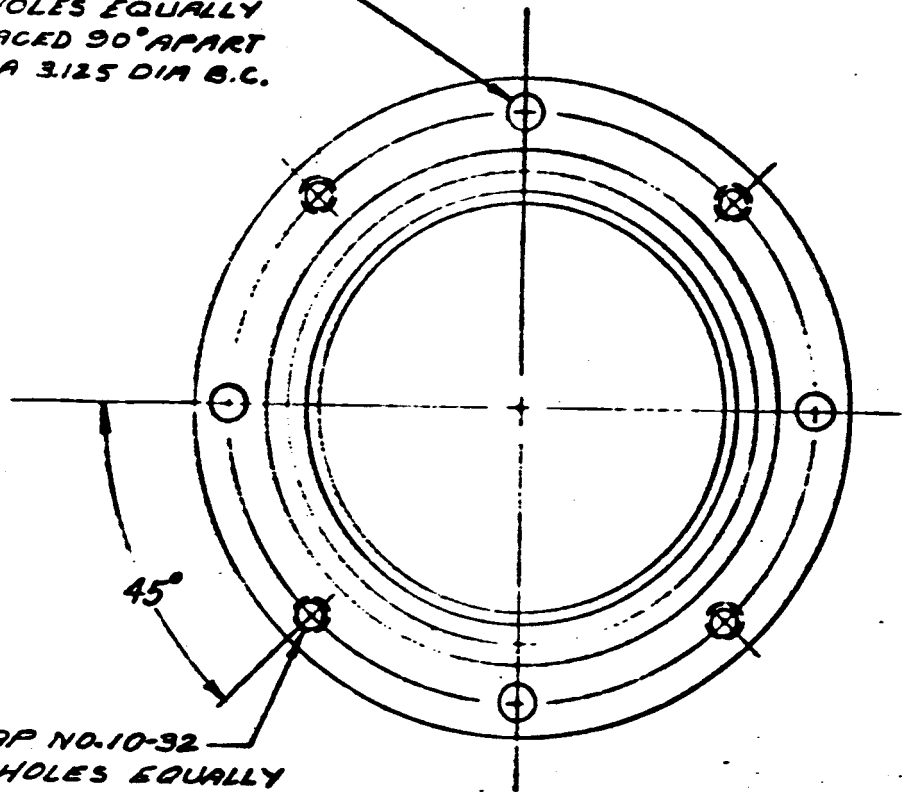
CLASSIFICATION:

(2)

DIMENSIONS IN INCHES - DO NOT SCALE PRINT

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DRILL NO.4 (209)  
4 HOLES EQUALLY  
SPACED 90° APART  
ON A 3.125 DIA B.C.



TAP NO.10-32  
4 HOLES EQUALLY  
SPACED 90° APART  
ON A 3.125 DIA B.C.

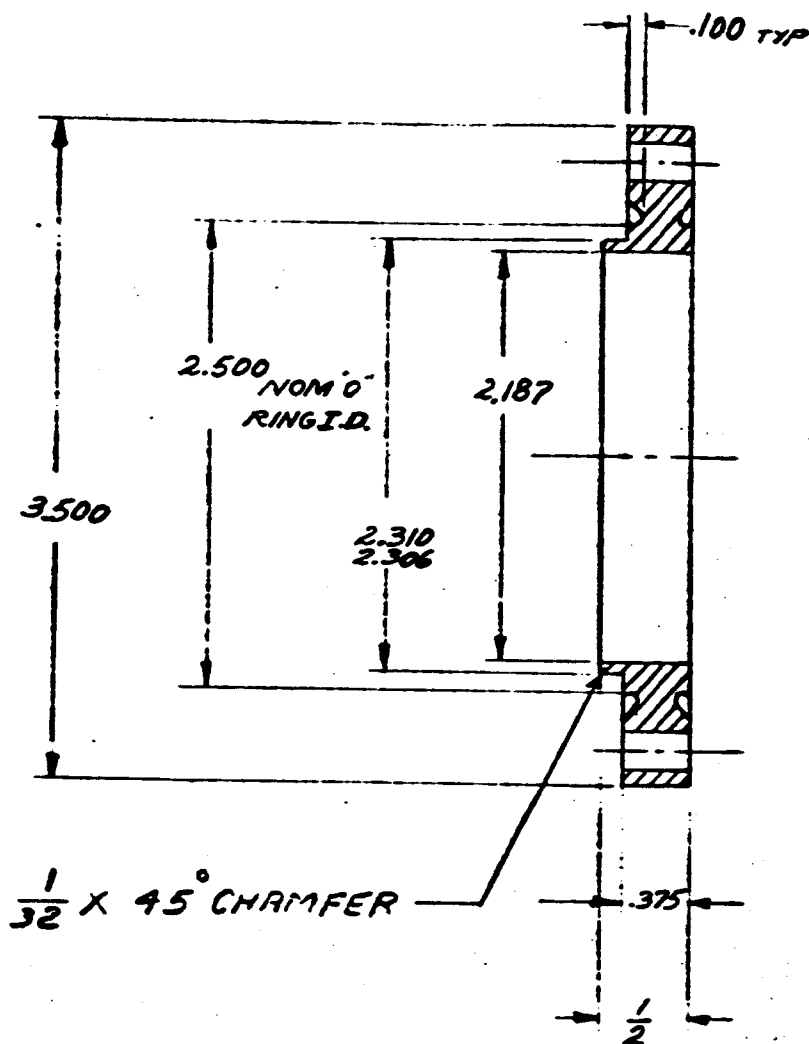
33 ①

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH
		MATERIAL <i>ALUM</i>
		HEAT TREATMENT <i>#</i>
NEXT ASSY	USED ON	FINAL FINISH <i>#</i>
APPLICATION		



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
1	CHAMFER ADDED	10-20-61	

RE-ORDER No. 62-543



2

EM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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# LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		
R	WFA	9-29-61
HK	Hick	10-10-61
PP		
PP		
PP		

PLATE, BOTTOM -  
VIEWING PORT



GEOPHYSICS  
CORPORATION  
OF AMERICA

DRAWING NUMBER

2-008-01-1010

SCALE

1:1

LOC B

SIZE B

SH. /

OF /

REV /

CLASSIFICATION.

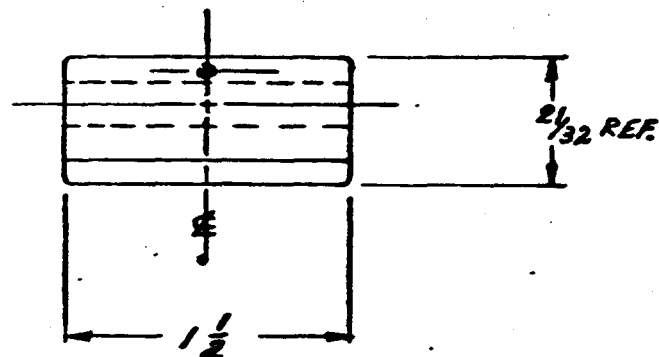
M - MINNEAPOLIS

L - LINCOLN

B - BEDFORD

DIMENSIONS IN INCHES - DO NOT SCALE PRINT

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY FOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THEREBY.



BREA

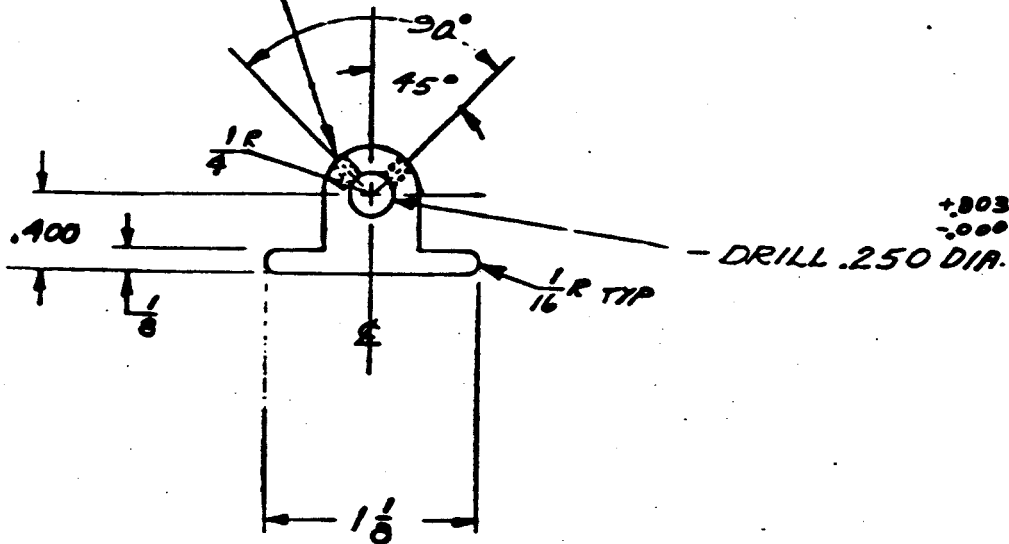
		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{8}$ DECIMALS $\pm .005$ ANGLES
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		O.F.H. COPPER
		HEAT TREATMENT
		<i>TH</i>
		FINAL FINISH
		<i>TH</i>
NEXT ASSY	USED ON	
APPLICATION		

34 ①

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543

TAP NO. 2-56  
2 HOLES  
90° APART




ALL EDGES

M-MINNEAPOLIS

L-LINCOLN

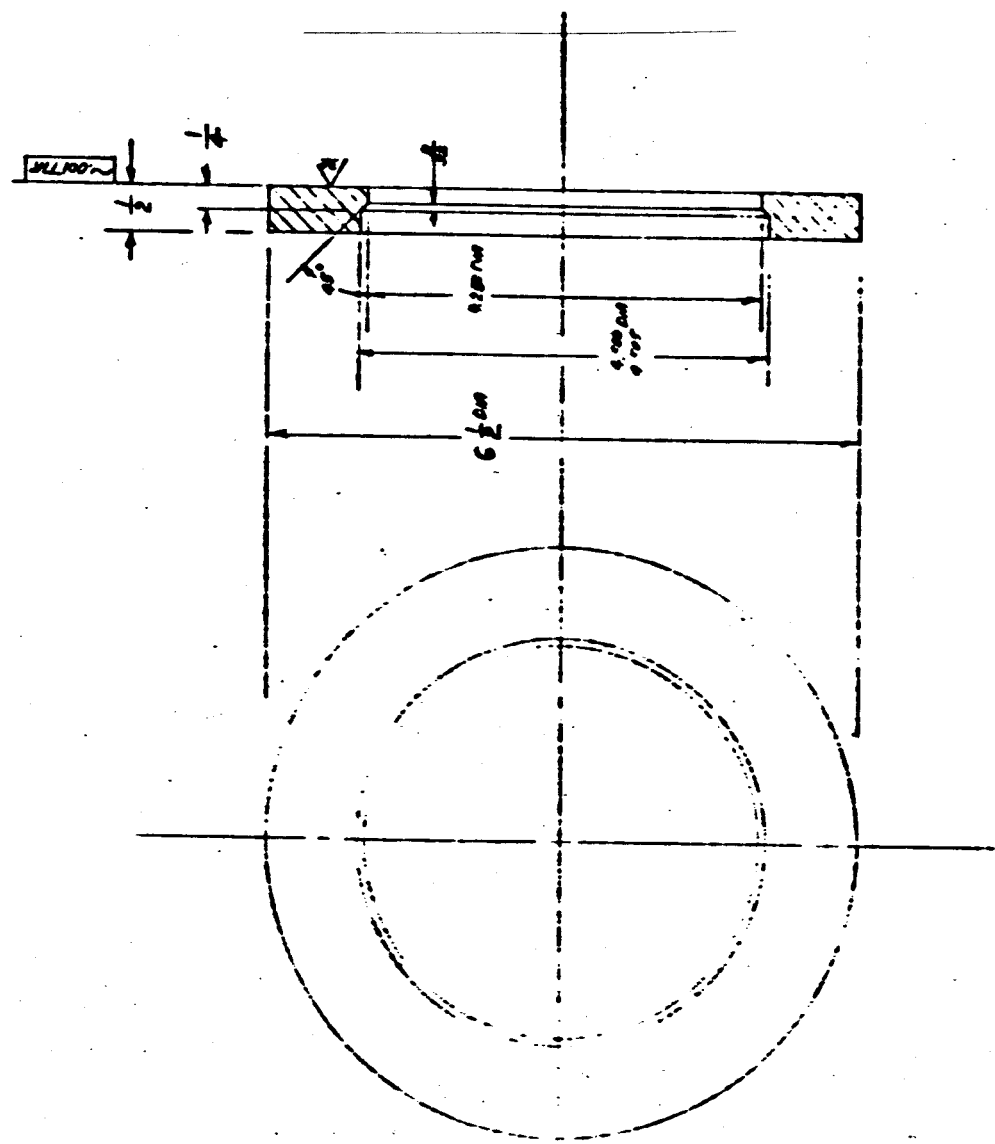
P-BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD	
<b>LIST OF MATERIAL</b>						
GEOPHYSICS CORPORATION OF AMERICA		DEFLECTION CONDENSER ELECTRODE II	 GEOPHYSICS CORPORATION OF AMERICA			
DR	WFA					2-26-61
CHK	H. H. H.					10-10-61
APP						
APP						
			DRAWING NUMBER			
			2-008-01-1011			
		SCALE 1:1	LOC B	SIZE B	SH. / OF / REV 0	

CLASSIFICATION:

34

RE-ORDER No. 62-543



BASE FLANGE -HOUSING

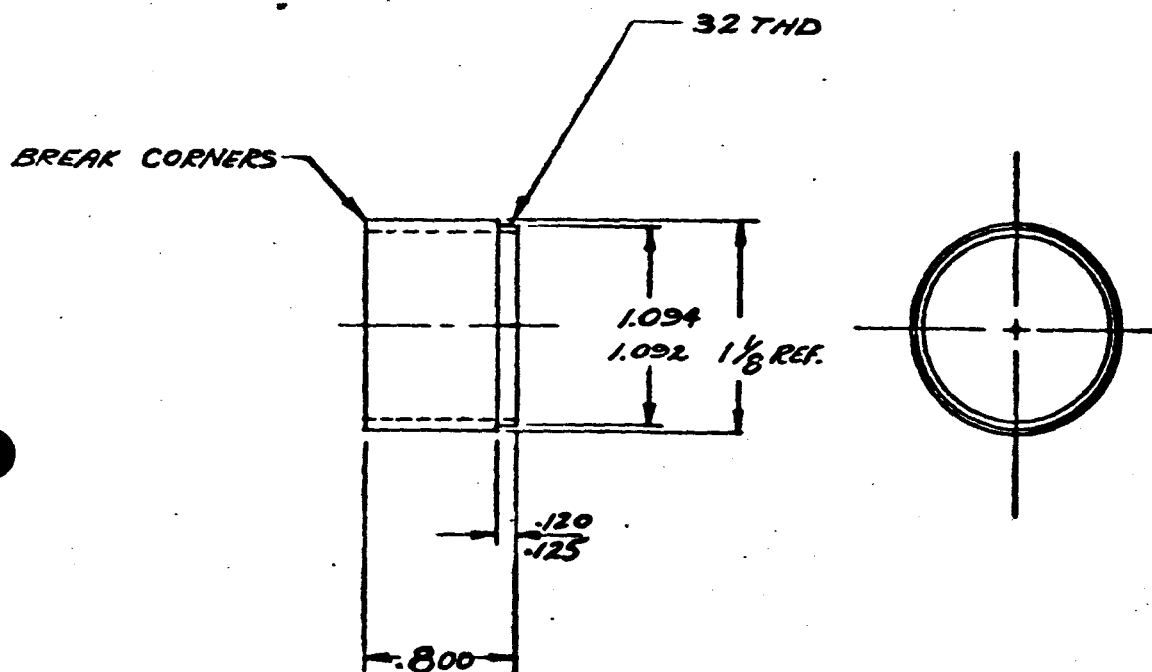
ITEM NO.	DATE	DESCRIPTION	DATE	DATE
LIST OF MATERIAL				
GEOPHYSICS CORPORATION OF AMERICA				
2-000-01-112				
REVISIONS				
REV.	DATE	DESCRIPTION	DATE	DATE
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DIMENSIONS IN INCHES — DO NOT SCALE PRINT

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



BREAK ALL SHARP EDGES

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRAC  $\frac{1}{8}$  DEC. .005 AND  $\frac{1}{2}$   
MACHINE FINISH

MATERIAL  
C.A.H. 1/8 O.D. X .065  
WALL, COPPER TUBING

HEAT TREATMENT

FINAL FINISH

GEOPHYSICS CORPORATION  
OF AMERICA

DR	WFA	9-25-61
CHK	WFA	10-10-61
APP		
APP		
APP		

TUBE- FOCUSING  
ELECTRODE



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE 1:1

2-008-01-1013

LOC B	SIZE A	SH. / OF /	REV 0
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CA-1001

CLASSIFICATION

M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

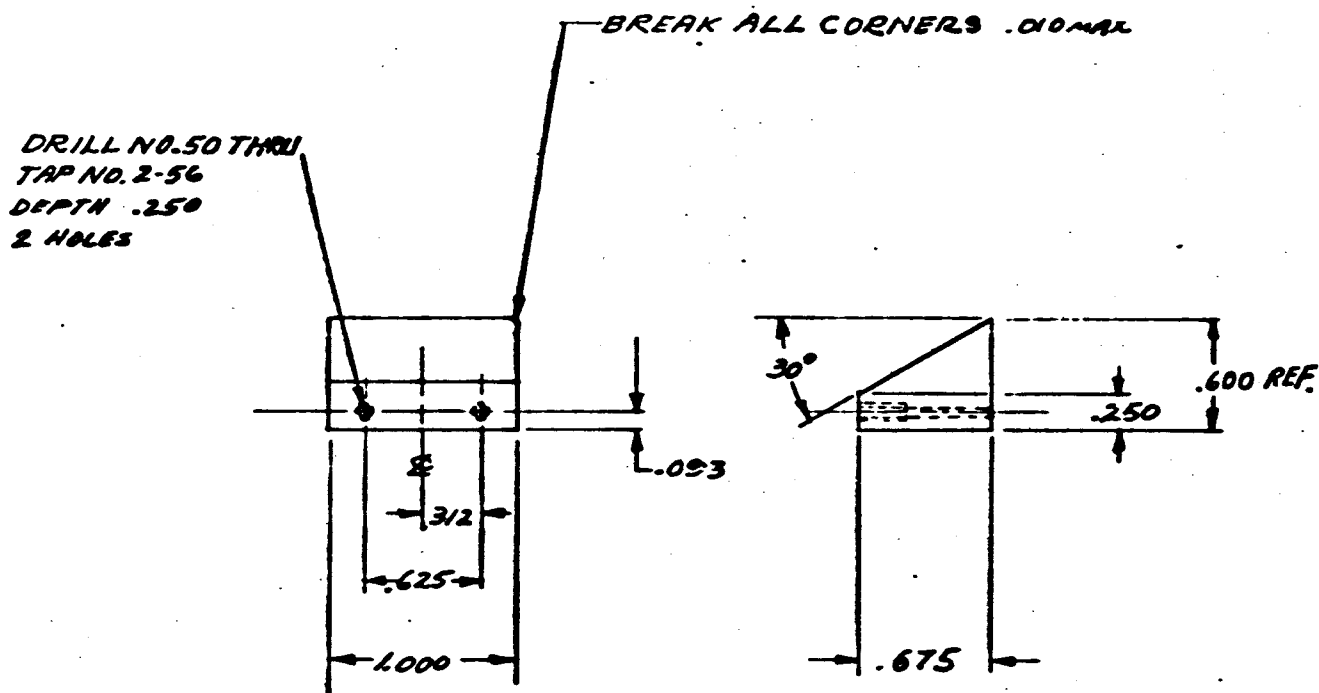
36

DIMENSIONS IN INCHES — DO NOT SCALE PRINT

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERE TO.

APPLICATION			REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL	

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRAC  $\pm \frac{1}{16}$  DEC  $\pm .005$  ANG  $\pm \frac{1}{2}$   
MACHINE FINISH

MATERIAL  
D.F.H. COPPER

HEAT TREATMENT

FINAL FINISH

GEOPHYSICS CORPORATION  
OF AMERICA

DR *WFA* 9-27-61

CHK *WFA* 10-11-61

APP

APP

APP

BLOCK ~ FOCUSING  
ELECTRODE



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE 1:1

2-008-01-1014

LOC 8 SIZE A SH. 1 OF 1 REV 0

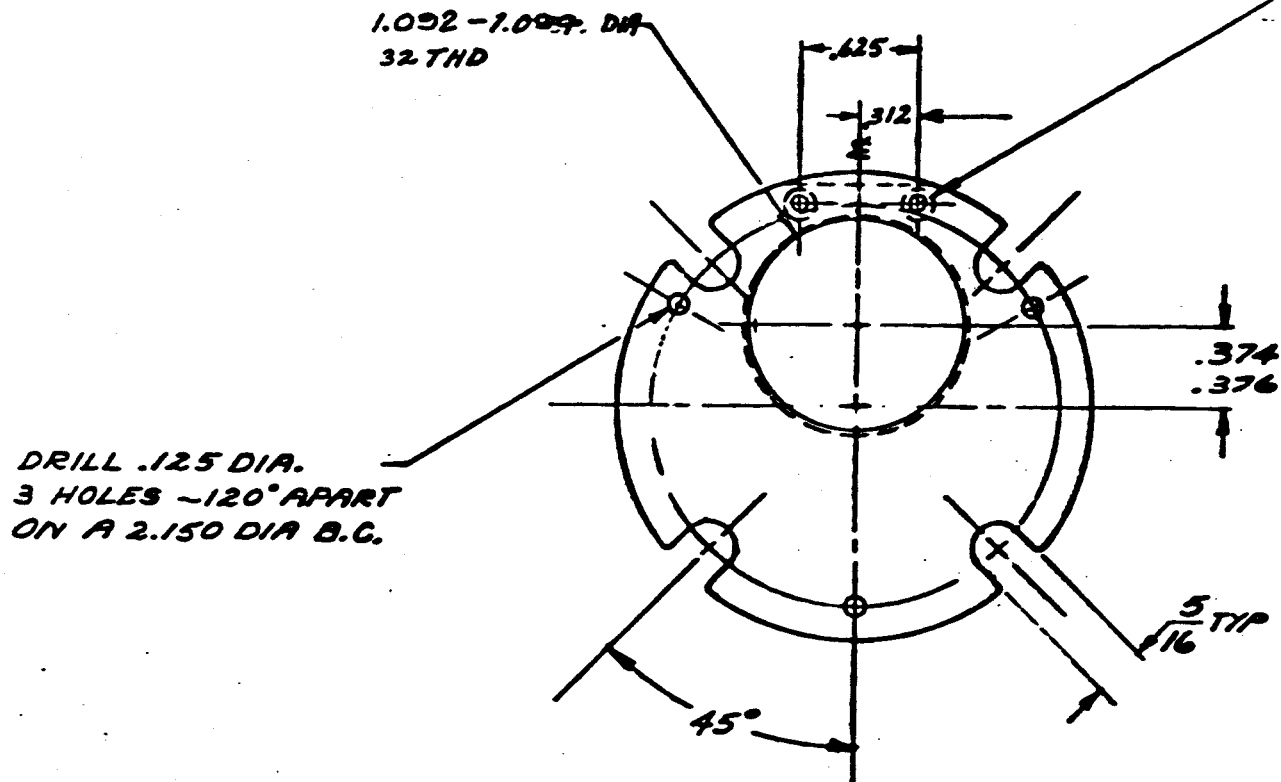
M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

37

NOTE: - THIS GOVERNMENT DRAWING, SPECIFICATIONS, OR OTHER DATA ARE TO BE USED ONLY IN CONNECTION WITH A DEFINITELY STATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT ASSUMES NO LIABILITY FOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY MANNER PROVIDED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE CONSIDERED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER ENDORSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THEREIN.



38①

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL O.F.H. COPPER
NEXT ASSY	USED ON	HEAT TREATMENT H
APPLICATION		FINAL FINISH H

# REVISIONS

SYM

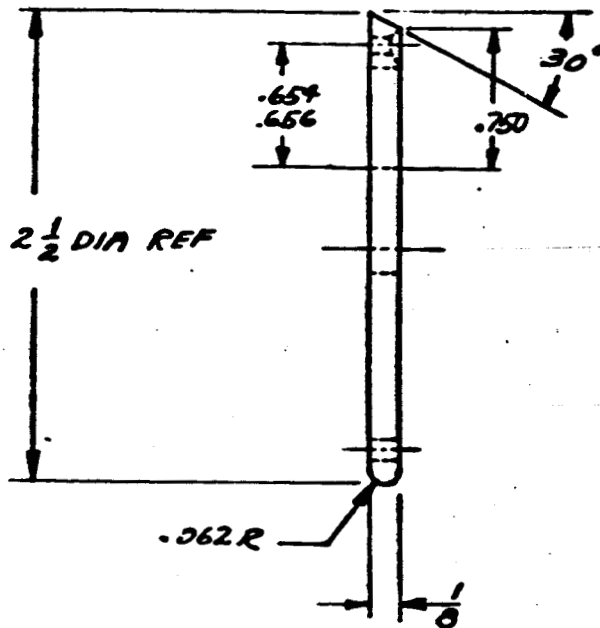
DESCRIPTION

DATE

APPROVAL

RE-ORDER No. 62-543

DRILL NO. 41 (D96)  
C'SINK 82° TO .172 DIA  
FROM OPP. SIDE  
2 HOLES



BREAK ALL EDGES

2

M - MINNEAPOLIS

L - LINCOLN

B - BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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## LIST OF MATERIAL

GEOPHYSICS CORPORATION  
OF AMERICA

DR	WF AMAN	9-25-61
CHK	R. H. L.	10-10-61
APP		
APP		
APP		

PLATE ~ FOCUSING  
ELECTRODE



GEOPHYSICS  
CORPORATION  
OF AMERICA

DRAWING NUMBER

2-008-01-1015

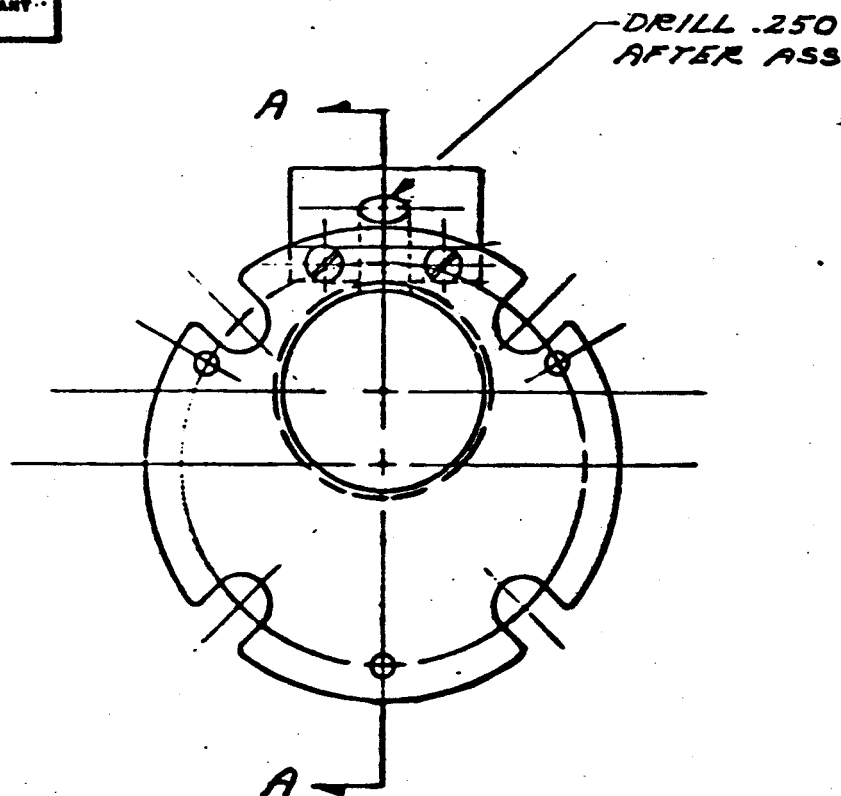
SCALE 1:1

LOC B SIZE B SH. 1 OF 1 REV 0

CLASSIFICATION:



NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE, AS IN ANY MANNER, LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.



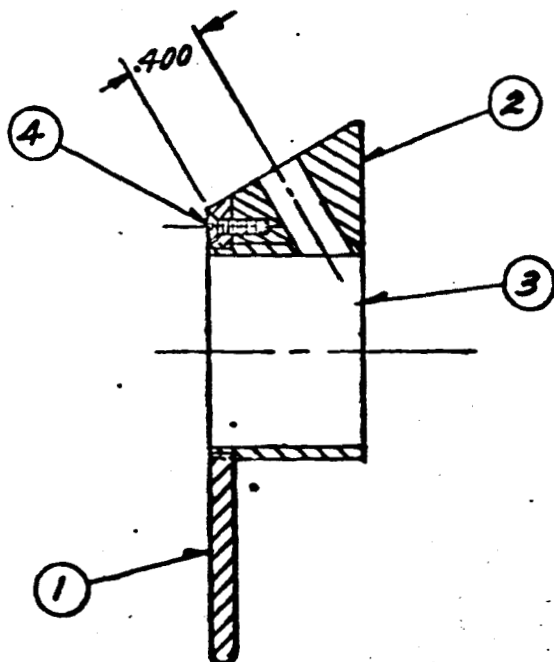
391

		UNLESS OTHERWISE SPECIFIED		
		DIMENSIONS ARE IN INCHES		
		TOLERANCES ON		
		FRACTIONS	DECIMALS	ANGLES
		MACHINE FINISH ✓		
		MATERIAL		
		#		
		HEAT TREATMENT		
		#		
		FINAL FINISH		
		#		
NEXT ASSY		USED ON		
APPLICATION				

DIA

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



VIEW A-A

M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

4		NO. 2-56 x 1/4 FLAT HD SCREW		PURCHASED	2
3	A2-008-01-1013	FOCUSING ELECTRODE TUBE	O.F.H.C		1
2	A2-008-01-1014	FOCUSING ELECTRODE BLOCK	O.F.H.C		1
1	B2-008-01-1015	FOCUSING ELECTRODE PLATE	O.F.H.C.		1
ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD

LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		
DR	WEA	9-28-61
CHK	Fluke	10-11-61
APP		
APP		
APP		

ASSEMBLY~FOCUSING  
ELECTRODE



GEOPHYSICS  
CORPORATION  
OF AMERICA

DRAWING NUMBER

2-008-01-1016

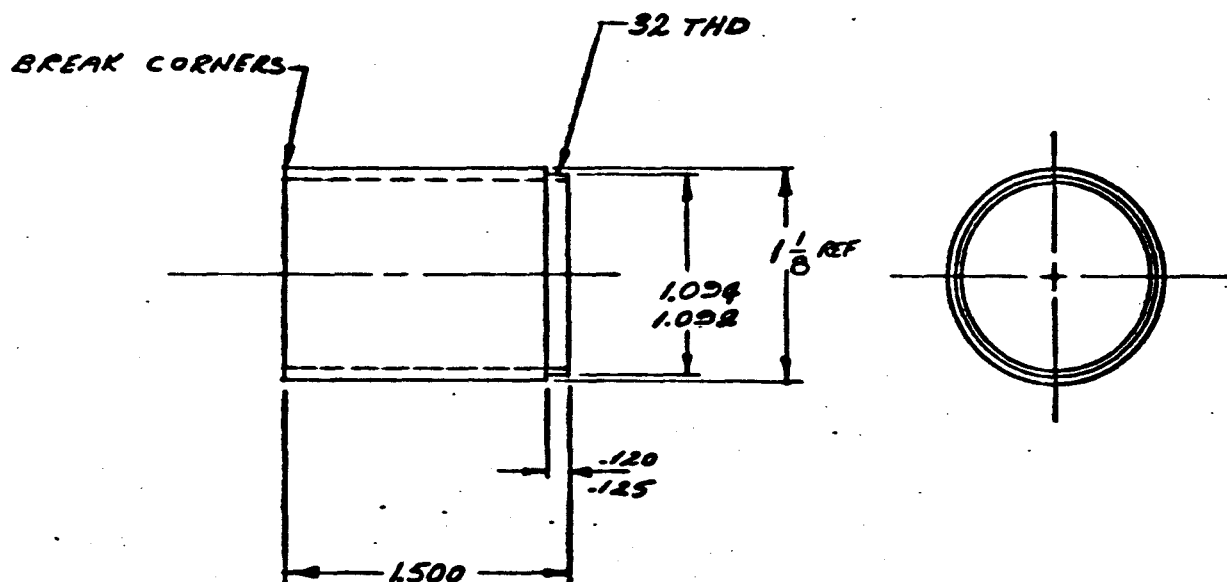
SCALE 1:1


LOC B SIZE B SN. 1 OF 1 REV 0

CLASSIFICATION:

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED		GEOPHYSICS CORPORATION OF AMERICA		TUBE - ACCELERATION  ELECTRODE		  GEOPHYSICS CORPORATION OF AMERICA			
DIMENSIONS ARE IN INCHES		DR	WFA					9-25-61	
TOLERANCES ON FRAC. 1/64 DEC. 1.005 ANG. 1/2		CHK	Fluke					10-10-61	
MACHINE FINISH		APP							
MATERIAL O.F.A.		APP			SCALE		2-008-01-1017		
1 1/8 O.D. x .065 WALL,		APP							
COPPER TUBING		APP							
HEAT TREATMENT									
FINAL FINISH					LOC B		SIZE A	SH. 1 OF 1	REV 0

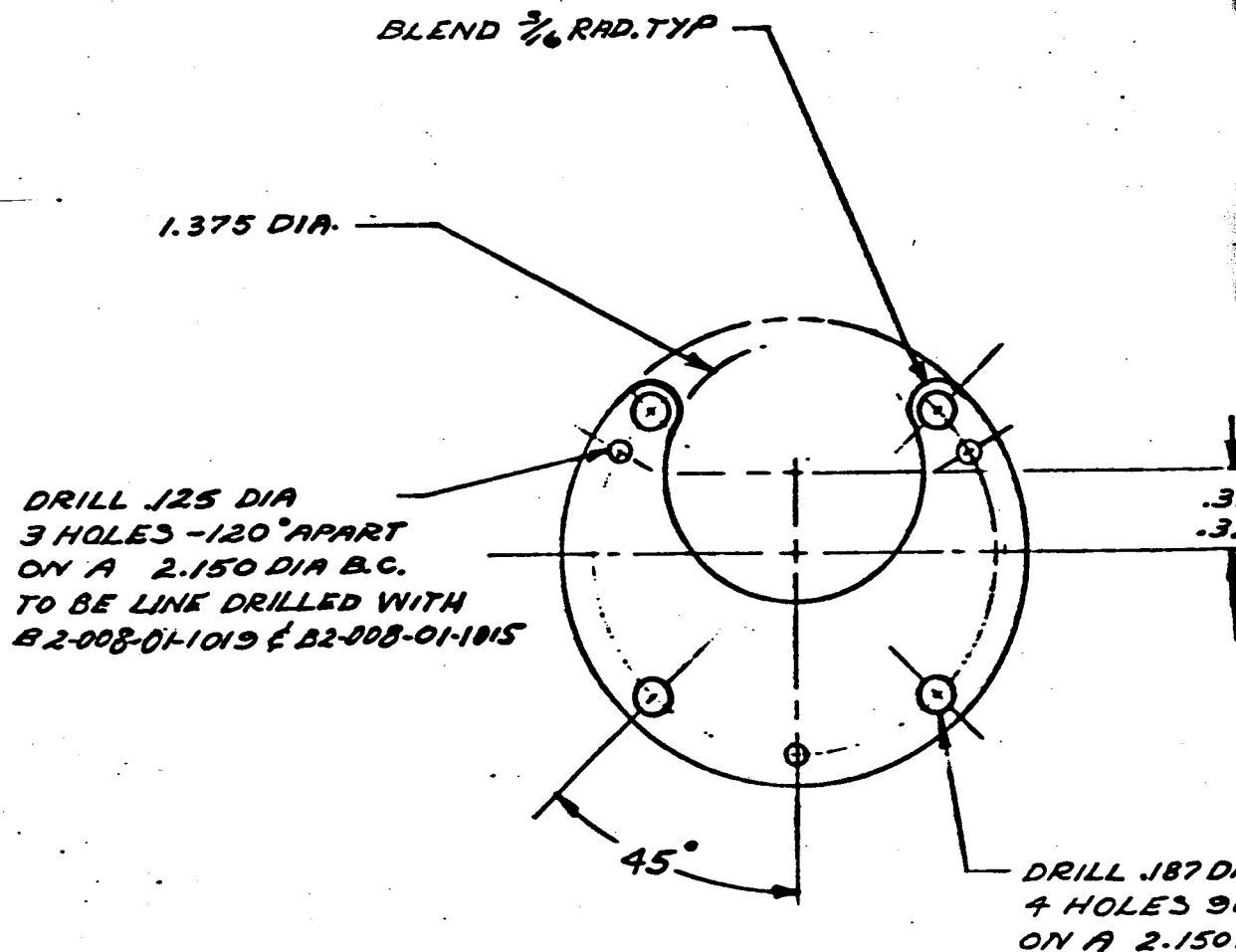
**M-MINNEAPOLIS**

**L-LINCOLN**

**B-BEDFORD**

40

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

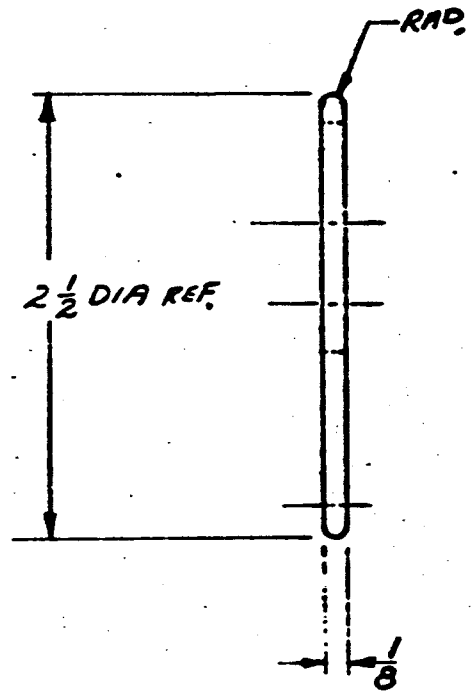


410

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		O.F.H. COPPER
		HEAT TREATMENT
		FINAL FINISH
NEXT ASSY	USED ON	
APPLICATION		

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



A.  
1° APART  
DIA B.C.

2

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		
DR	WEA	9-25-61
CHK	W.H.C.	10-10-61
APP		
APP		
APP		

MOUNTING RING



GEOPHYSICS CORPORATION OF AMERICA

DRAWING NUMBER

2-008-01-1018

SCALE 1:1

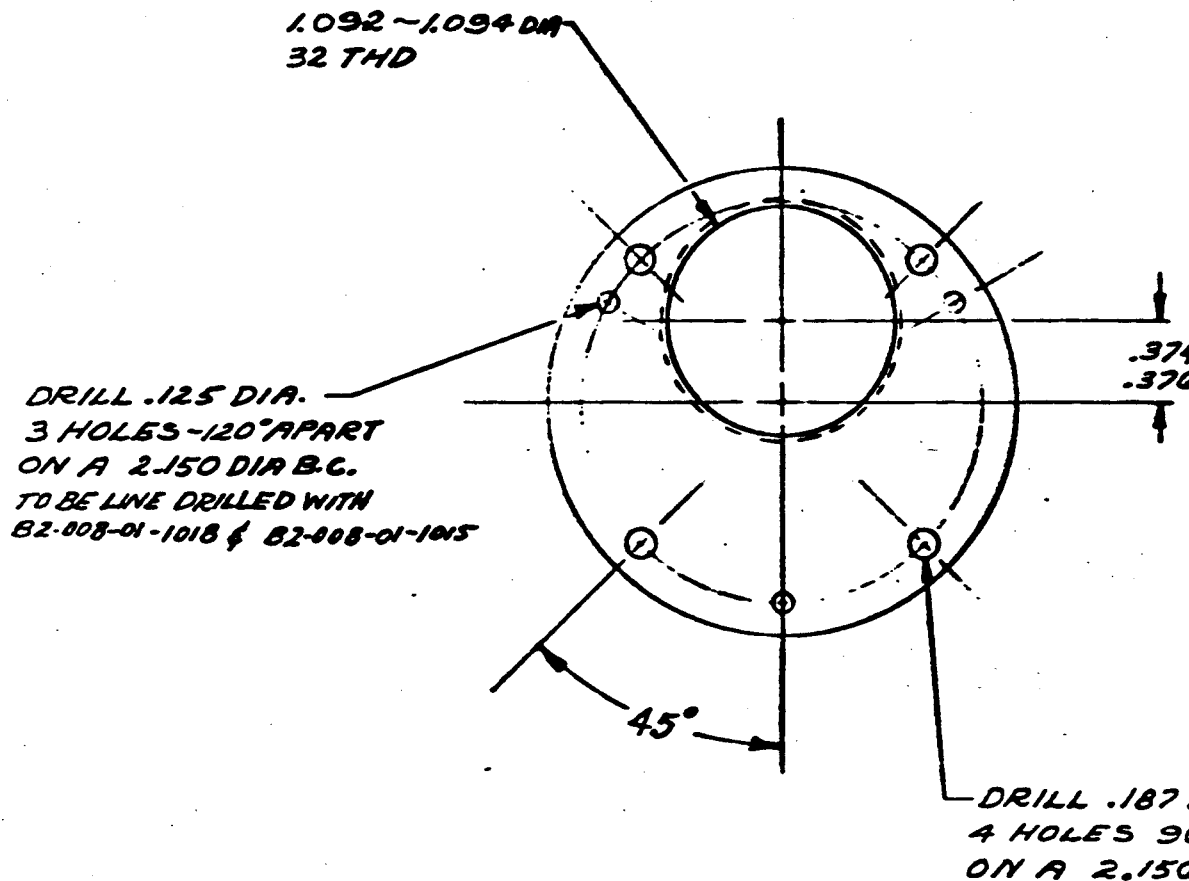
LOC B SIZE B SH. / OF / REV 0

CLASSIFICATION:

M-MINNEAPOLIS  
L-LINCOLN  
B-BEDFORD

DIMENSIONS IN INCHES - DO NOT SCALE PRINT

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

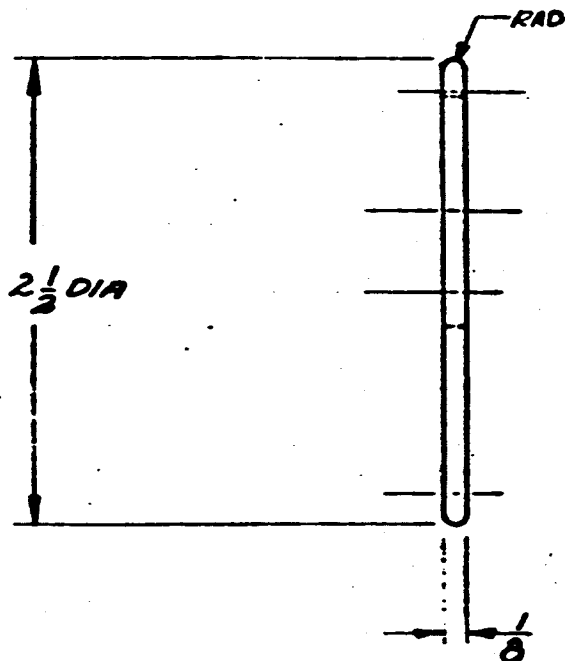


420

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm 1'$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		O.F.H. COPPER
		HEAT TREATMENT
		<i>TH</i>
		FINAL FINISH
		<i>TH</i>
NEXT ASSY	USED ON	
APPLICATION		

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



DIA  
0° APART  
DIA B.C.

M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
LIST OF MATERIAL					
GEOPHYSICS CORPORATION OF AMERICA		PLATE-ACCELERATION ELECTRODE	GEOPHYSICS CORPORATION OF AMERICA		
DR	WFA		9-25-61		
CHK	KLIC		10-10-61		
APP					
APP					
			DRAWING NUMBER		
			2-008-01-1019		
SCALE		1:1	LOC B	SIZE B	SH. / OF / REV 0

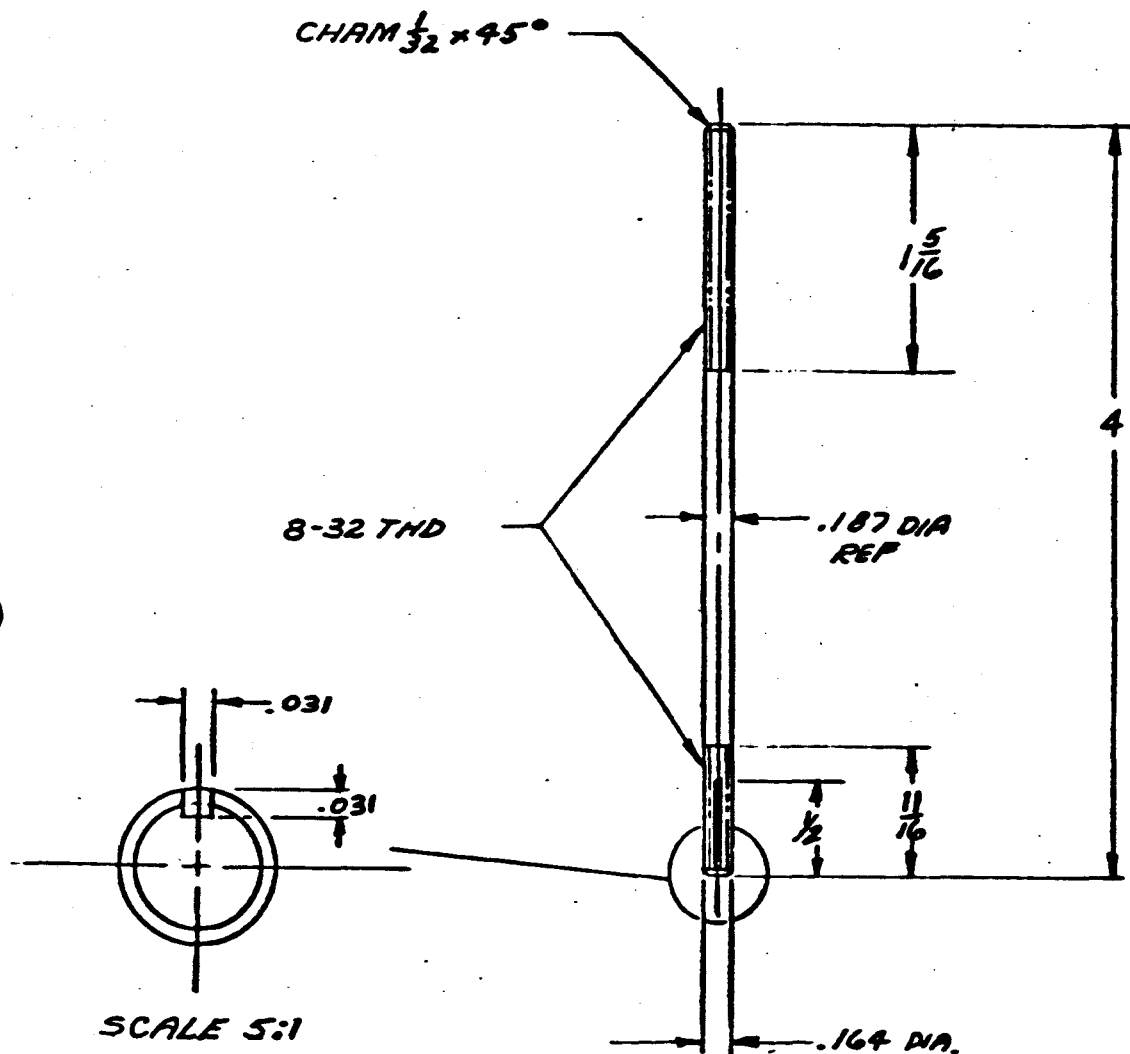
CLASSIFICATION:

DIMENSIONS IN INCHES — DO NOT SCALE PRINT

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS AND ANGLES
MACHINE FINISH
MATERIAL
304 STAINLESS STEEL
HEAT TREATMENT
FINAL FINISH

GEOPHYSICS CORPORATION OF AMERICA		
DR	WFA	9-28-61
CHK	Huhl	10-10-61
APP		
APP		
APP		

SHAFT ~ LOCATING	
SCALE	1:1
2-008-01-1020	
LOC B	SIZE A
SH. 1 OF 1	REV 0

GEOPHYSICS CORPORATION OF AMERICA	

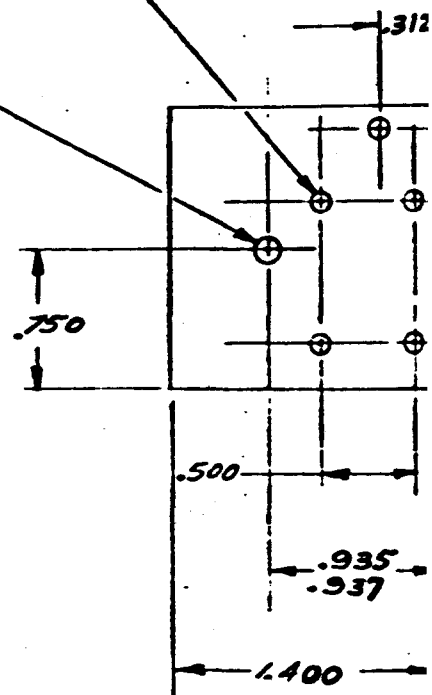


DIMENSIONS IN INCHES - DO NOT SCALE PRINT

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER. AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DRILL NO. 41 (.096)  
5 HOLES

DRILL .125 DIA



44 (1)

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		J.F.H. COPPER
		HEAT TREATMENT
		TH
		FINAL FINISH
		TH
NEXT ASSY	USED ON	
APPLICATION		

# REVISIONS

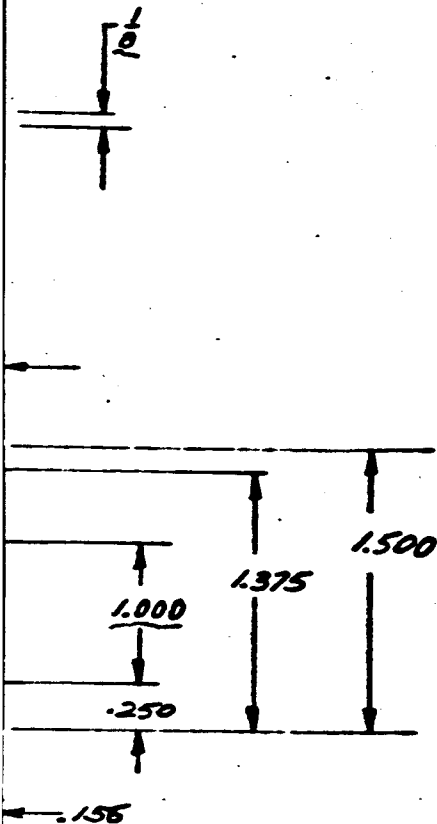
SYM

DESCRIPTION

DATE

APPROVAL

RE-ORDER No: 62-543




BREAK ALL SHARP EDGES



M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
<b>LIST OF MATERIAL</b>					
<b>GEOPHYSICS CORPORATION OF AMERICA</b> DR <i>WEA</i> 9-28-61 CHK <i>H. J. R. L.</i> 10-11-61 APP APP APP		<b>CONDENSER SHIELD I</b>	 <b>GEOPHYSICS CORPORATION OF AMERICA</b>		
			DRAWING NUMBER		
			2-008-01-1021		
		SCALE 1:1	LOC B	SIZE B	SN. 1 OF 1 REV 0

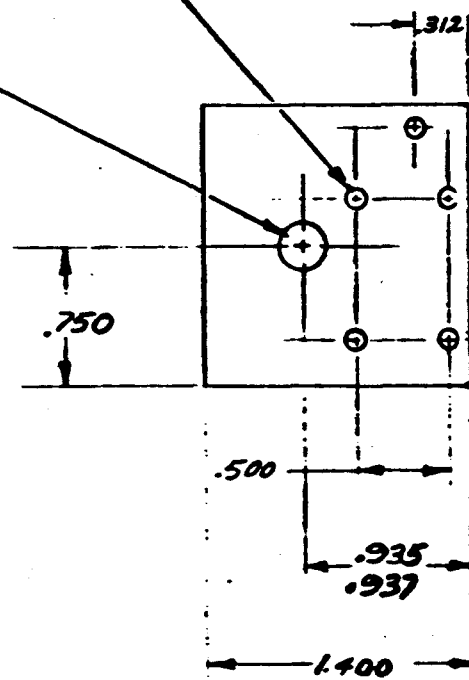
CLASSIFICATION:

44

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSEING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DRILL NO. 41(.096)  
5 HOLES

DRILL .250 DIA

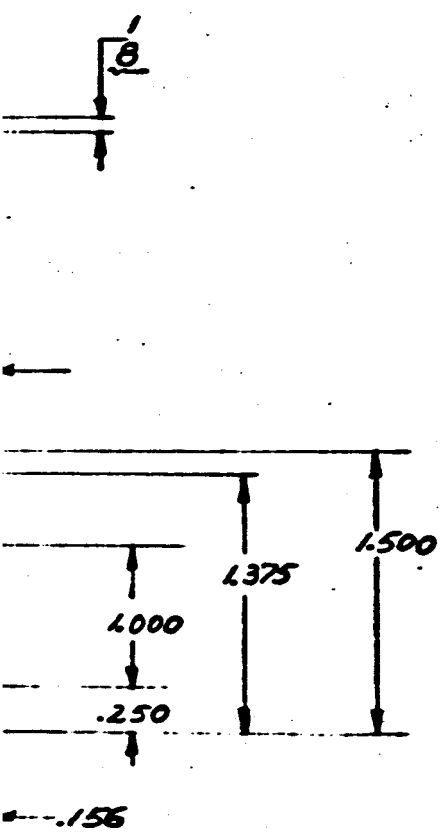


450

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		O.F.H. COPPER
		HEAT TREATMENT
		#
		FINAL FINISH
		#
NEXT ASSY	USED ON	
APPLICATION		

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

PE-ORDER No. 62-543

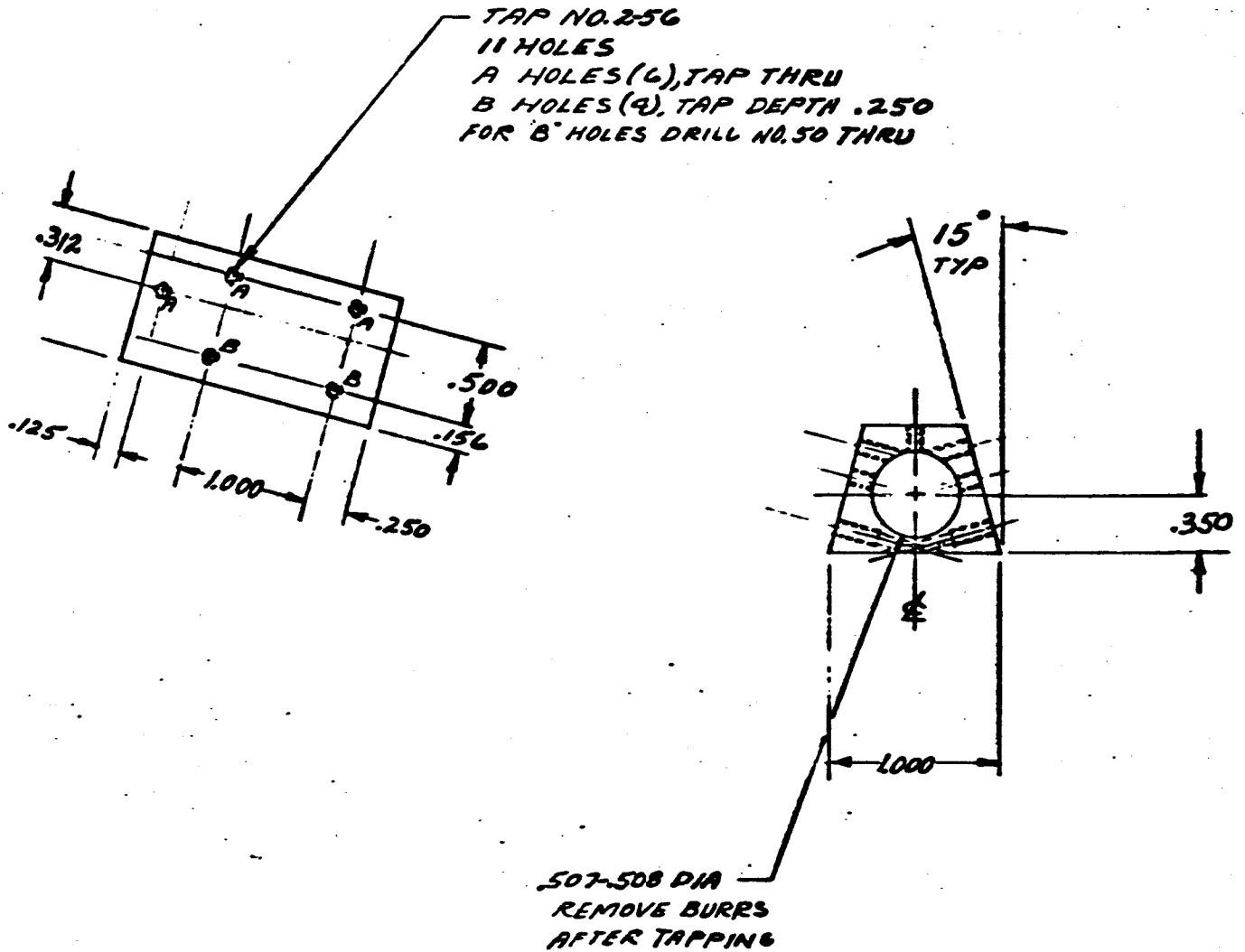


M-MINNEAPOLIS  
L-LINCOLN  
B-BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
LIST OF MATERIAL					
GEOPHYSICS CORPORATION OF AMERICA DR <i>WFA</i> 9-28-61 CHK <i>WFA</i> 10-11-61 APP APP APP		CONDENSER SHIELD II  SCALE 1:1	GEOPHYSICS CORPORATION OF AMERICA  DRAWING NUMBER 2-008-01-1022		
			LOC B SIZE B SH. / OF / REV 0		

CLASSIFICATION:

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

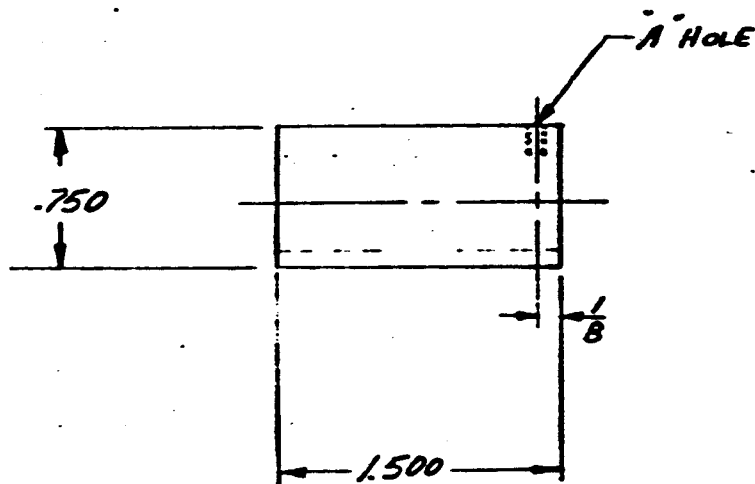


4/8 ①

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}$
		MACHINE FINISH $\checkmark$
		MATERIAL
		O.F.H. COPPER
		HEAT TREATMENT
		#
		FINAL FINISH
		#
NEXT ASSY	USED ON	
APPLICATION		

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543




BREAK ALL SHARP EDGES

2

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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### LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		DEFLECTION CONDENSER ELECTRODE I	 GEOPHYSICS CORPORATION OF AMERICA	
DR	WFA			
CHK	WFA			
APP				
APP				
		SCALE 1:1	DRAWING NUMBER	
			2-008-01-1023	
			LOC B	SIZE B

CLASSIFICATION:

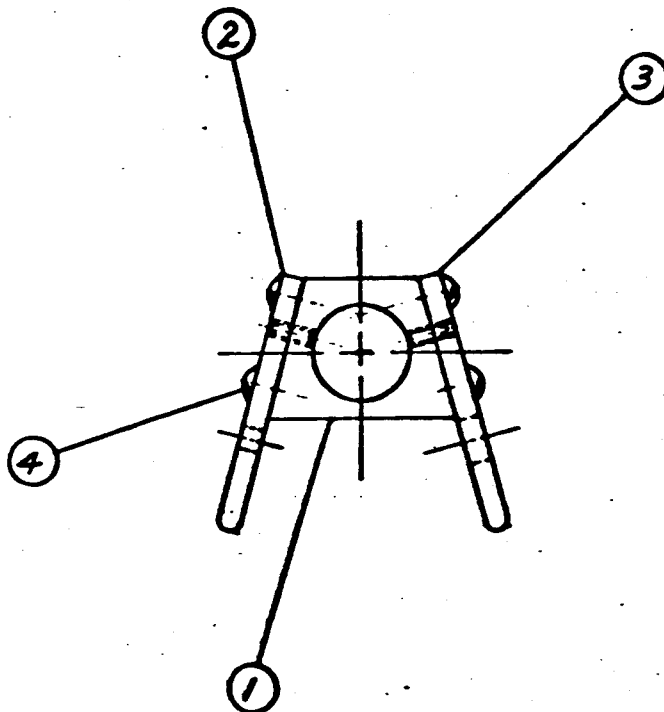
M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

46

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THEREOF.

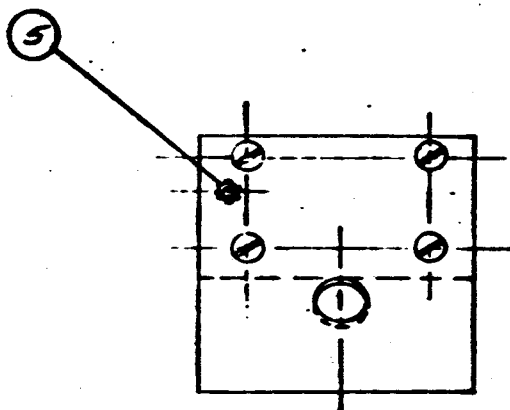


471

		UNLESS OTHERWISE SPECIFIED		
		DIMENSIONS ARE IN INCHES		
		TOLERANCES ON		
		FRACTIONS	DECIMALS	ANGLES
		MACHINE FINISH ✓		
		MATERIAL		
		#		
NEXT ASSY		HEAT TREATMENT		
		#		
APPLICATION		FINAL FINISH		
		#		

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL


RE-ORDER No. 62-543



472

5		#2-56 x 1/4 SOC SET SCR		PURCHASED	3
4		#2-56 RD HD. MACH. SCR		PURCHASED	8
3	B2-008-01-1022	CONDENSER SHIELD II	O.F.H.C.		1
2	B2-008-01-1021	CONDENSER SHIELD I	O.F.H.C.		1
1	B2-008-01-1023	DEFLECTION COND. ELECT. I	O.F.H.C.		1
ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD

# LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		ASSY - DEFLECTION CONDENSER ELECTRODE & SHIELDS	 GEOPHYSICS CORPORATION OF AMERICA		
DR	WFA		10-11-61		
CHK	WFA		10-11-61		
APP					
			DRAWING NUMBER		
			2-008-01-1024		
SCALE 1:1		LOC B	SIZE B	SH. 1 OF 1	REV 0

CLASSIFICATION:

M - MINNEAPOLIS

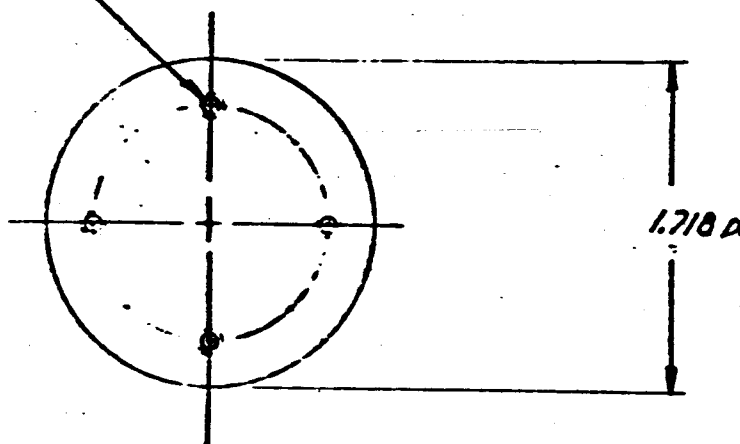
L - LINCOLN

B - BEDFORD



NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSES THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

TAP NO. 8-32  
4 HOLES, EQUALLY  
SPACED 90° APART  
ON A 1.250 DIA. B.C.  
BOTTOM TAP TO .187 DEPTH  
THESE HOLES LOCATED  
FROM B2-008-A-1026

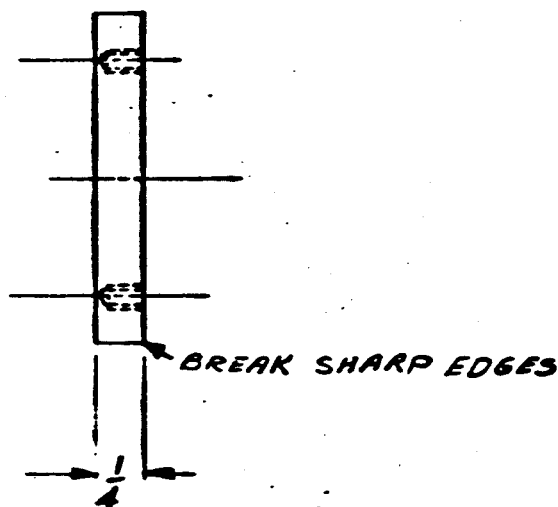


44610

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		O.F.H. COPPER
		HEAT TREATMENT
		#
		FINAL FINISH
		#
NEXT ASSY	USED ON	
APPLICATION		

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543




482

M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
LIST OF MATERIAL					
GEOPHYSICS CORPORATION OF AMERICA DR <i>WFA</i> CHK <i>LMC</i> APP APP APP		TARGET PLATE	GEOPHYSICS CORPORATION OF AMERICA 		
10-9-61 10-12-61			DRAWING NUMBER 2-008-01-1025		
SCALE 1:1			LOC B SIZE B SM. / OF / REV 0		

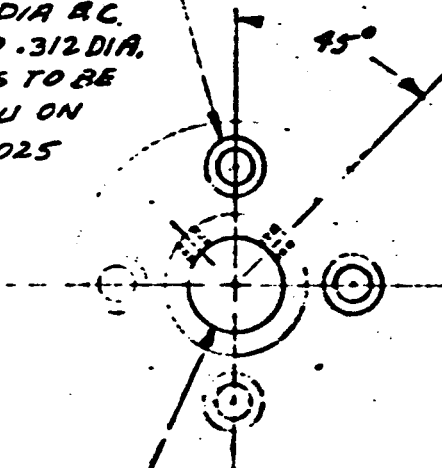
CLASSIFICATION:

48

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DRILL NO.17(173)  
4 HOLES EQUALLY  
SPACED 90° APART  
ON A 1.250 DIA B.C.  
C'SINK 82° TO .312 DIA.  
THESE HOLES TO BE  
SPOTTED THRU ON  
B2-008-01-1025

.500-.505 DIA

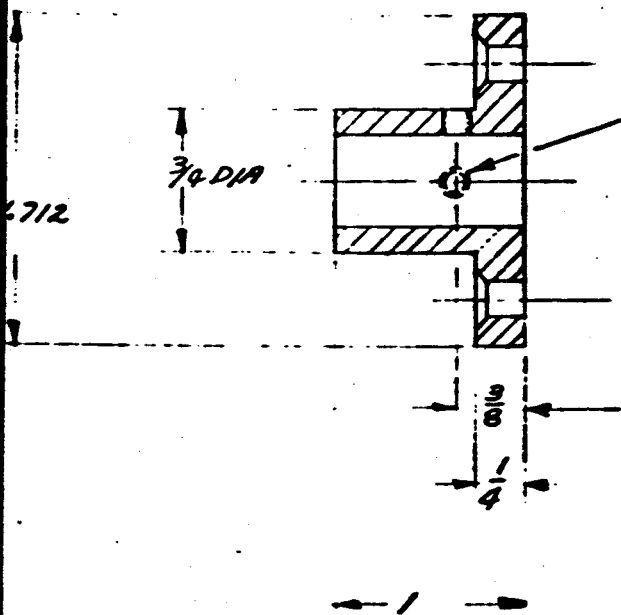


490

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{16}$ DECIMALS $\pm .005$ ANGLES $\pm 1'$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		O.F.H. COPPER
		HEAT TREATMENT
NEXT ASSY	USED ON	
APPLICATION		FINAL FINISH

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543




BREAK ALL SHARP EDGES

2

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
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LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		TARGET PLATE HOLDER	 GEOPHYSICS CORPORATION OF AMERICA	
DR	WEA			
CHK	Hill			
APP				
APP				
		SCALE 1:1	LOC B	SIZE B
			SH. / OF /	REV 0
		DRAWING NUMBER		
		2-CO. 01-1026		

CLASSIFICATION:

M-MINNEAPOLIS

L-LINCOLN

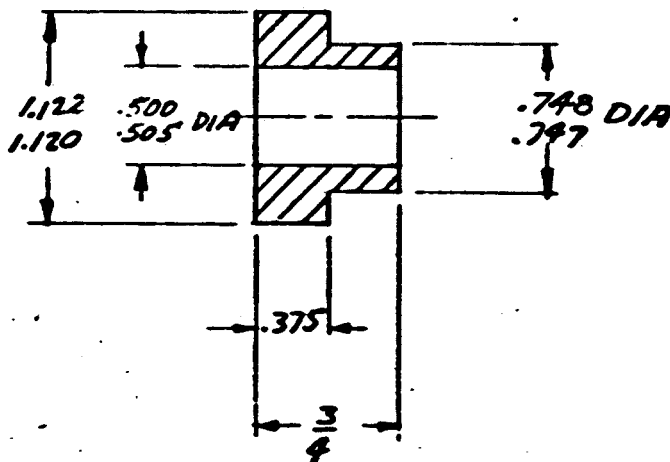
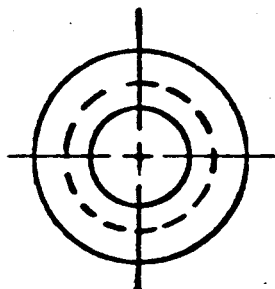
B-BEDFORD

DIMENSIONS IN INCHES — DO NOT SCALE PRINT

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

APPLICATION			REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL	

RE-ORDER No. 62-543



BREAK ALL SHARP EDGES

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRAC 1/16 DEC +.005 ANG  $\pm \frac{1}{2}$   
MACHINE FINISH ✓

MATERIAL

TEFLON

HEAT TREATMENT

⌘

FINAL FINISH

⌘

GEOPHYSICS CORPORATION  
OF AMERICA

DR	WES	10-10-61
CHK	WES	10-12-61
APP		
APP		
APP		

TARGET BEARING  
(REAR)



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE 1:1

2-008-01-1028

LOC B	SIZE A	SH. 1 OF 1	REV 0
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CLASSIFICATION

M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

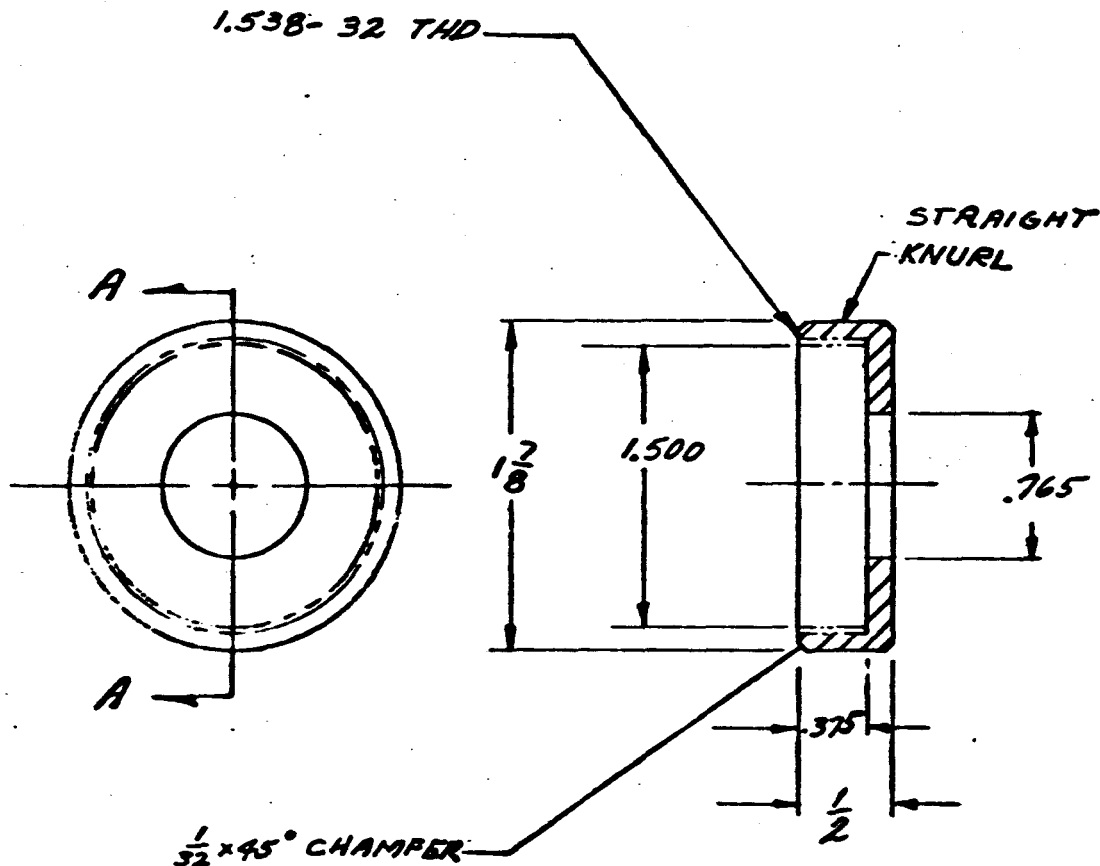
50

DIMENSIONS IN INCHES -- DO NOT SCALE PRINT

NOTICE -- WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERE TO.

APPLICATION			REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL	

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRACTIONS DECIMALS AND  
MACHINE FINISH

MATERIAL  
ALUM

HEAT TREATMENT

FINAL FINISH

GEOPHYSICS CORPORATION  
OF AMERICA

DR	INFA	10-10-61
CHK	Black	10-12-61
APP		
APP		
APP		

CLAMP-TARGET  
BEARING ASSY



GEOPHYSICS  
CORPORATION  
OF AMERICA

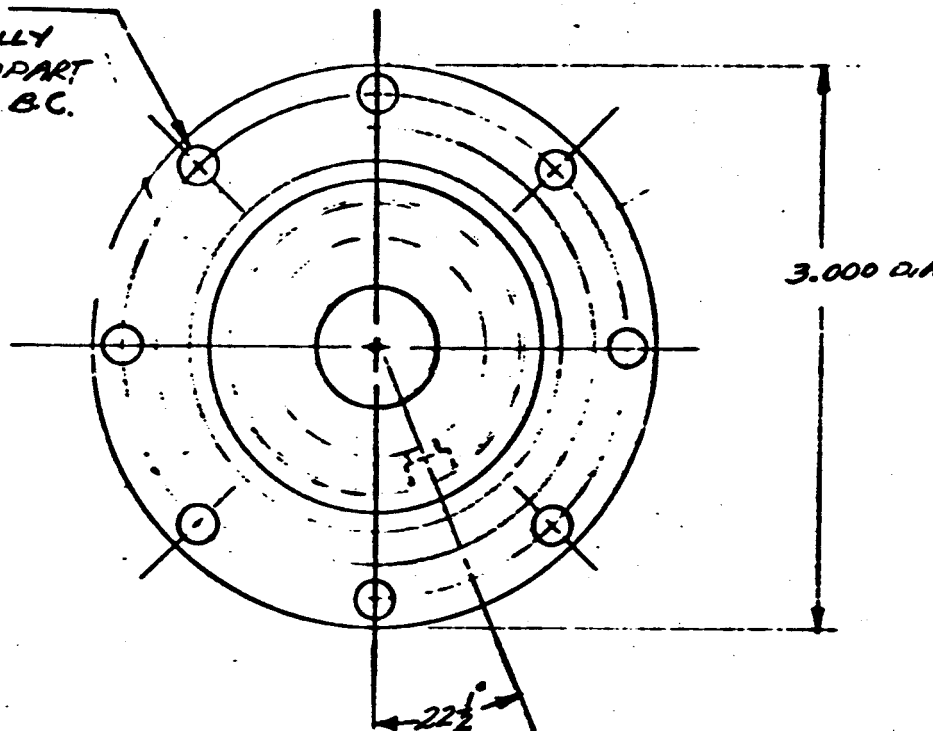
SCALE 1:1

2-008-01-1029

LOC B SIZE A SH. 1 OF 1 REV 0 51

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSES THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DRILL (.203)  
8 HOLES EQUALLY  
SPACED 45° APART  
ON A 2.625 DIA B.C.

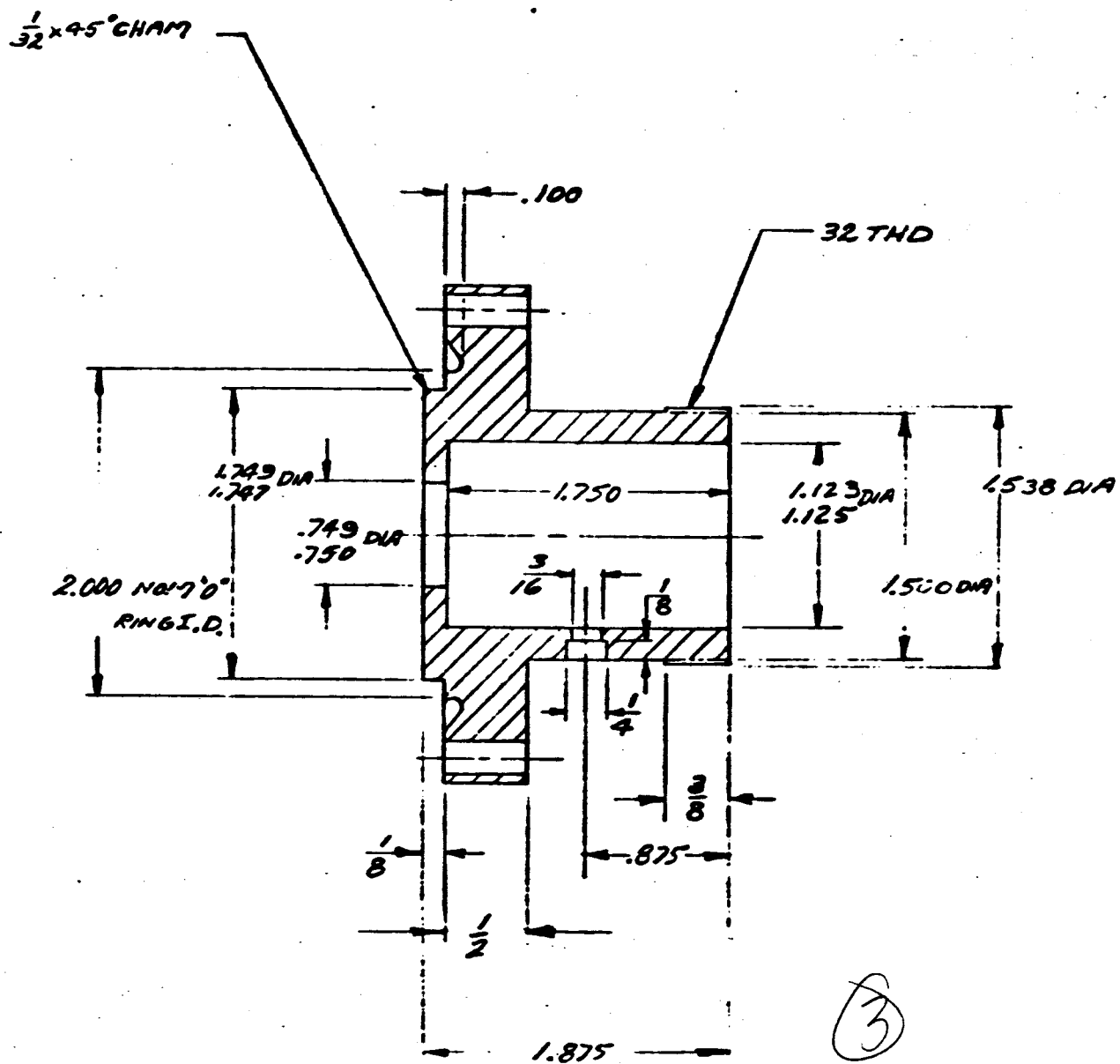


52①

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{16}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		304 STAINLESS STL
NEXT ASSY	USED ON	HEAT TREATMENT
APPLICATION		FINAL FINISH

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL


RE-ORDER No. 62-543



M - MINNEAPOLIS  
L - LINCOLN  
B - BEDFORD

M NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA WFA 10-9-61 K 10-12-61 P P P		HOUSING ~ TARGET BEARING ASSY	 GEOPHYSICS CORPORATION OF AMERICA
SCALE 1:1			
LOC B SIZE B SH. 1 OF 1 REV 0			

DRAWING NUMBER  
2-008-01-1030

CLASSIFICATION:

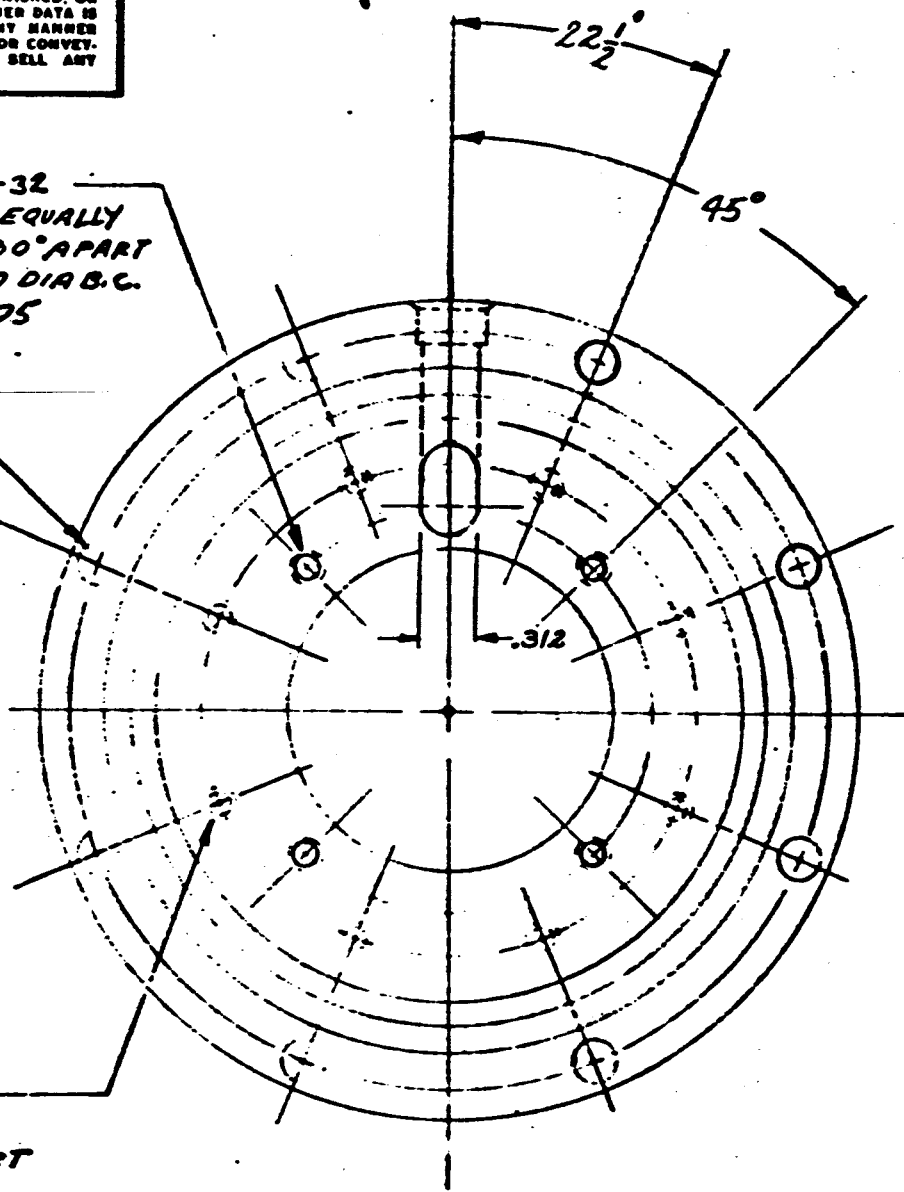


NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSEING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

TAP NO. 8-32  
4 HOLES EQUALLY  
SPACED 90° APART  
ON A 2.150 DIA B.C.  
DEPTH .375

DRILL .203 DIA  
8 HOLES EQUALLY  
SPACED 45° APART  
ON A 4.000 DIA B.C.

TAP NO. 10-32  
8 HOLES EQUALLY  
SPACED 45° APART  
ON A 2.625 DIA B.C.  
DEPTH .500 FROM OPP  
FACE

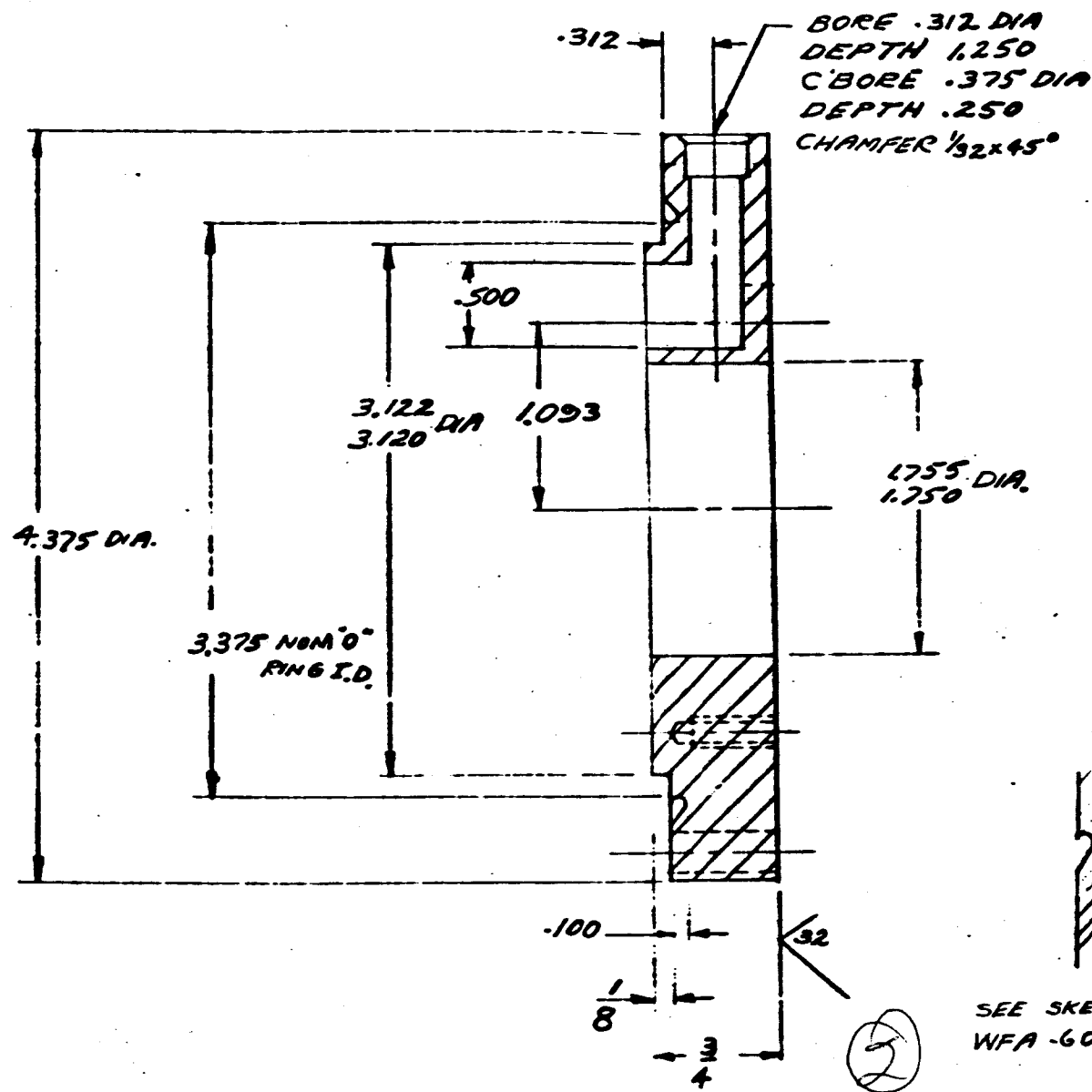


53①

		UNLESS OTHERWISE SPECIFIED	ITEM
		DIMENSIONS ARE IN INCHES	DR
		TOLERANCES ON	CHI
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$	APV
		MACHINE FINISH $\sqrt{32}$	API
		MATERIAL	APP
		309 STAINLESS ST'G	
NEXT ASSY	USED ON	HEAT TREATMENT	
APPLICATION		FINAL FINISH	

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



M-MINNEAPOLIS

L-LINCOLN

B-BEAFORD

NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA	
INVEA	10-13-61
WFA	10-16-61

ELECTRODE  
MOUNTING FLANGE



GEOPHYSICS  
CORPORATION  
OF AMERICA

DRAWING NUMBER

2-008-01-1031

SCALE

1:1

LOC

SIZE B

SH.

OF

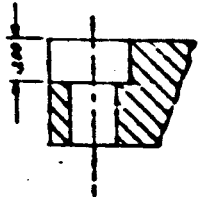
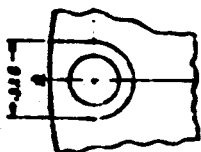
REV

0

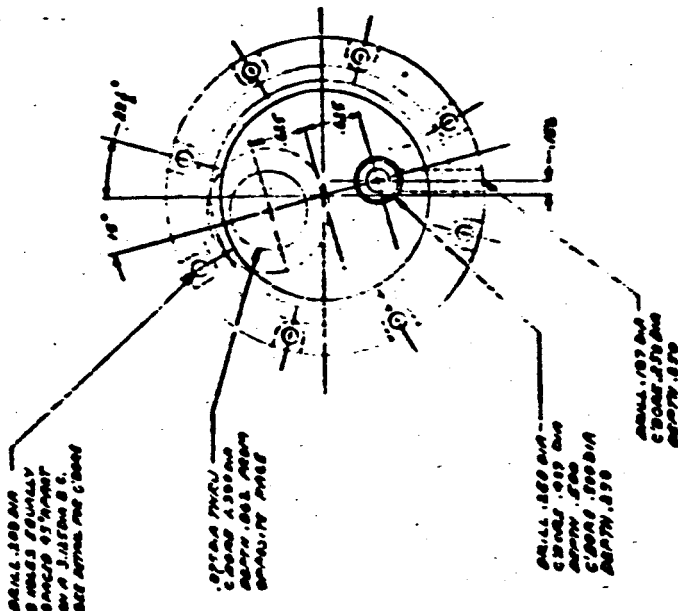
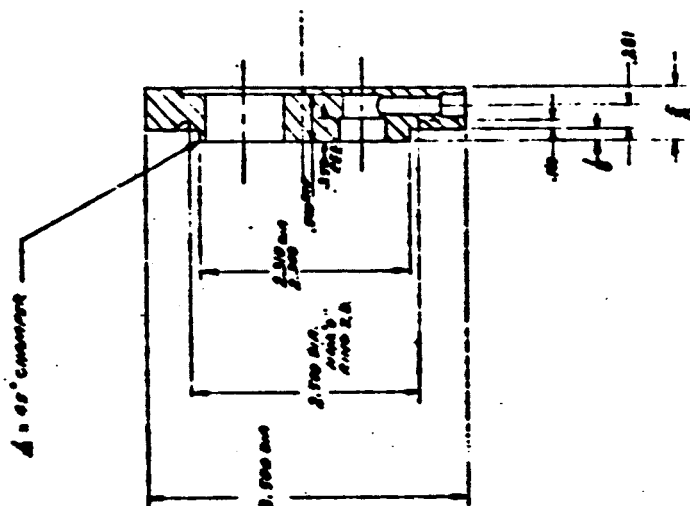
CLASSIFICATION:

RE-ORDER No. 62-543

RECEIVED

[illegible]

11/17/2000  
10:00  
11/17/2000

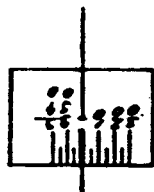


DIMENSIONS IN INCHES — DO NOT SCALE PRINT

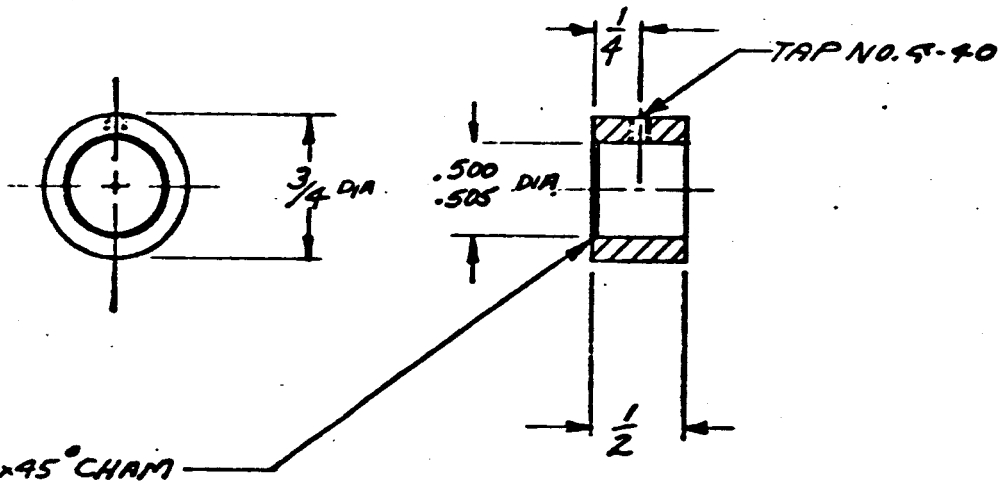
NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERE TO.

APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



EACH 5° LINE TO  
BE .093 LONG.  
EACH 10° LINE TO  
BE .187 LONG.  
DEPTH OF LINES  
TO BE .005 DEEP  
WIDTH OF LINE  
.005



UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRAC 1/16 DEC .005 ANG 1/2  
MACHINE FINISH

MATERIAL  
6061-T6 ALUM

HEAT TREATMENT  
H

FINAL FINISH  
H

GEOPHYSICS CORPORATION  
OF AMERICA

DR	J. K. FEA	10-16-61
CHK	J. K. FEA	10-18-61
APP		
APP		
APP		

TARGET HOUSING  
RETAINING RING



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE 1:1

2-008-01-1033

LOC B SIZE A SH 1 OF 1 REV 0

M-MINNEAPOLIS

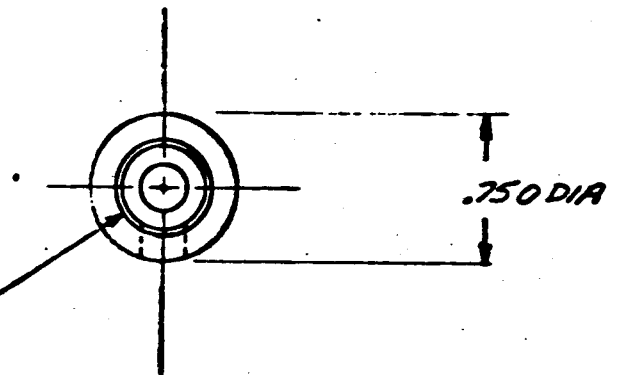
L-LINCOLN

B-BEDFORD

55

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

DRILL .250 DIA  
C'BORE .437 DIA.  
DEPTH .500  
C'BORE .500 DIA  
DEPTH .250

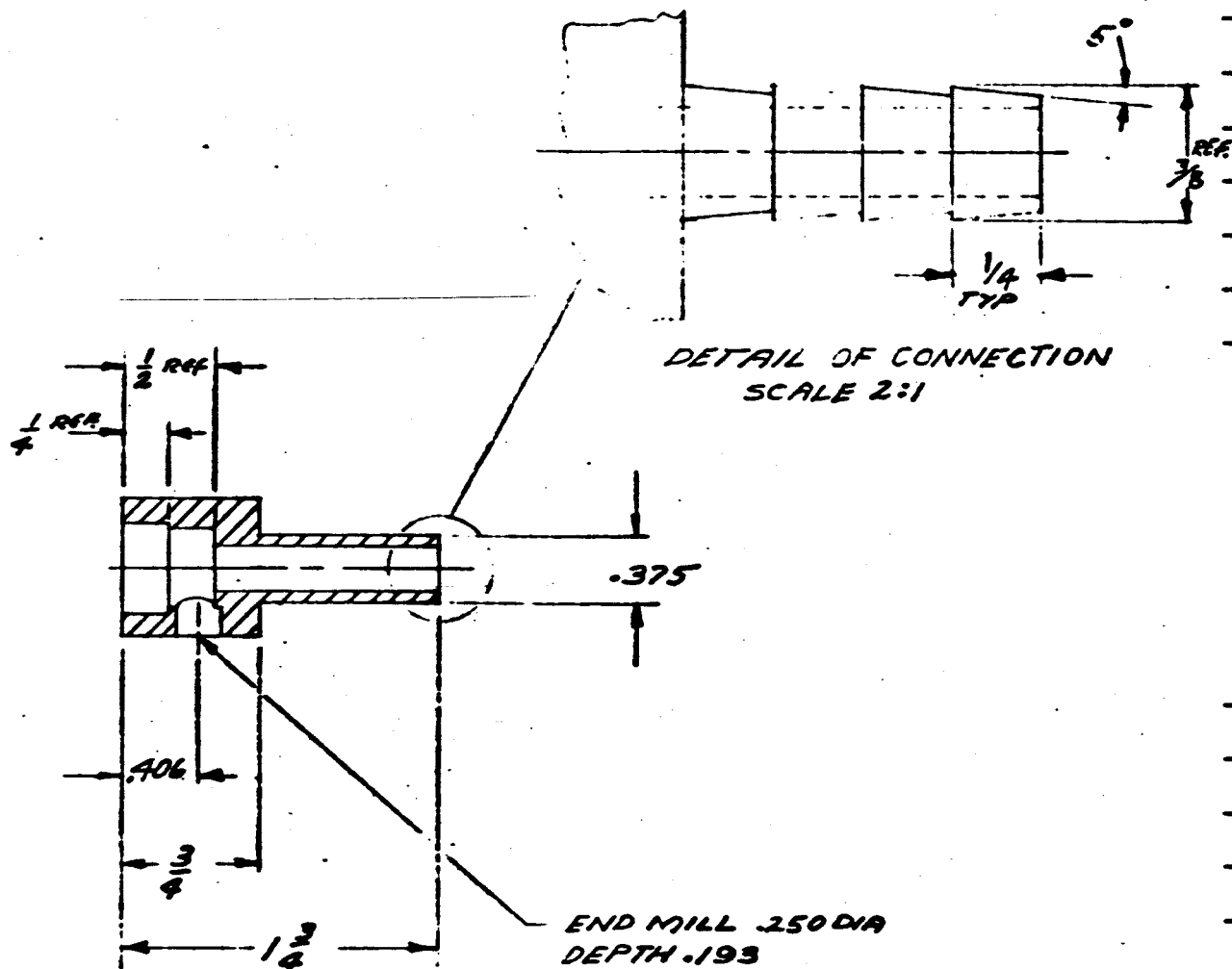


5 7/8

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm 1'$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		BRASS
		HEAT TREATMENT
NEXT ASSY	USED ON	#
APPLICATION		FINAL FINISH
		#

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543




M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
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### LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		TARGET TUBING CONNECTION	 GEOPHYSICS CORPORATION OF AMERICA		
R	WEA		DRAWING NUMBER 2-008-01-1034		
HK	10-12-61				
PP	10-12-61				
PP					
PP					
		SCALE 1:1	LOC B	SIZE B	SH. 1 OF 1 REV 0

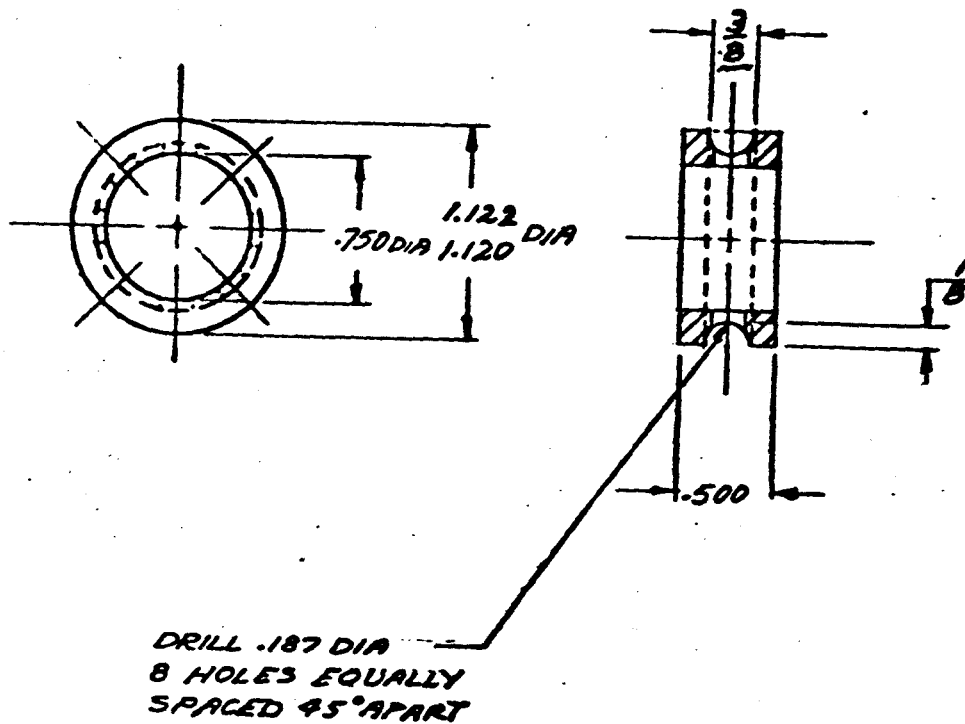
CLASSIFICATION

ALL DIMENSIONS IN INCHES — DO NOT SCALE PRINT

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

APPLICATION			REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL	

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRAC.  $\frac{1}{16}$  DEC.  $\pm .005$  AND  $\frac{1}{32}$   
MACHINE FINISH  $\checkmark$

MATERIAL  
**ALUM**

HEAT TREATMENT  
**H**

FINAL FINISH  
**H**

GEOPHYSICS CORPORATION  
OF AMERICA

DR	<b>WEP</b>	<b>10-18-61</b>
CHK	<b>W. E. C.</b>	<b>10-19-61</b>
APP		
APP		
APP		

**SPACER-TARGET  
HOUSING**



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE **1:1**

**2-008-01-1035**

LOC **B** SIZE **A** SH. **1** OF **1** REV **0** 57

A-1001

CLASSIFICATION

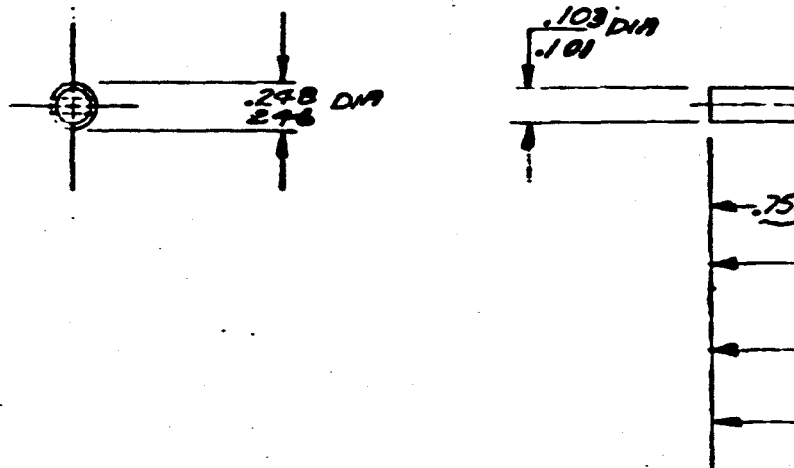
M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

DIMENSIONS IN INCHES - DO NOT SCALE PRINT

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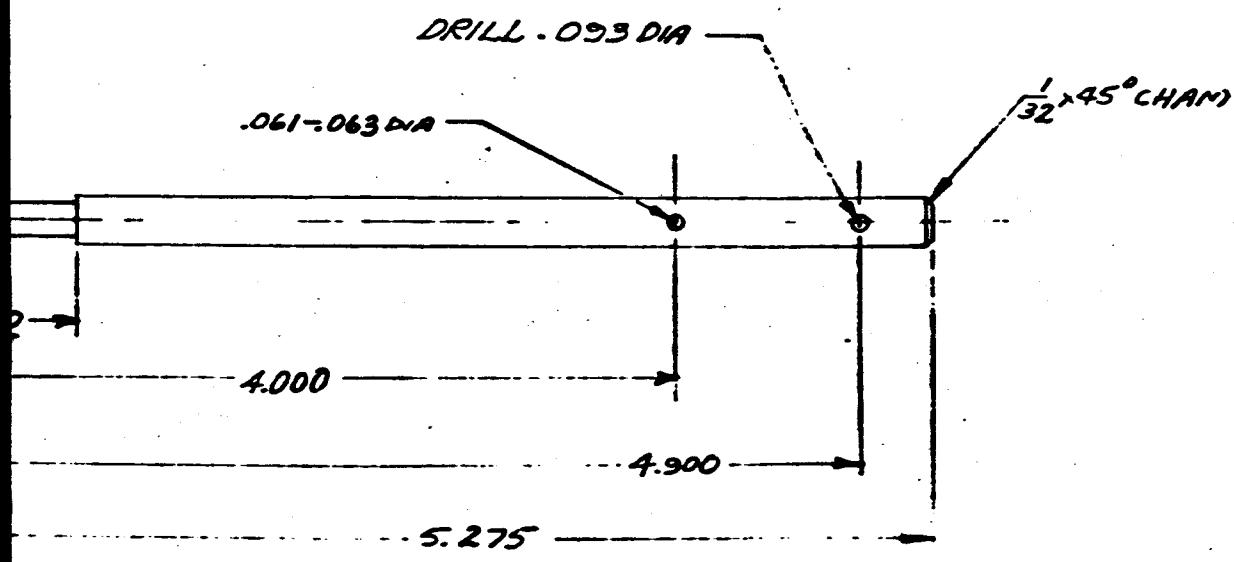
580

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		ST. ST'L
		HEAT TREATMENT
		#
		FINAL FINISH
		#
NEXT ASSY	USED ON	
APPLICATION		



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL


RE-ORDER No. 62-543



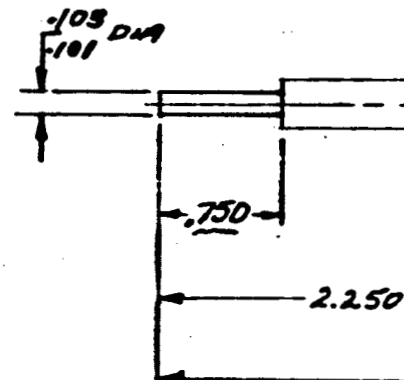
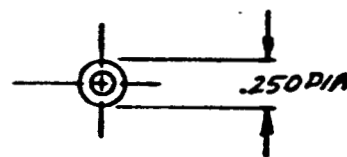
M - MINNEAPOLIS  
L - LINCOLN  
B - BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		SHAFT (ALITE 2-5-1C)	 GEOPHYSICS CORPORATION OF AMERICA			
DR	WFA		10-18-61			
CHK						
APP						
APP						
SCALE 1:1			DRAWING NUMBER 2-008-01-1036			
CLASSIFICATION			LOC 5	SIZE B	SH. / OF /	REV C

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

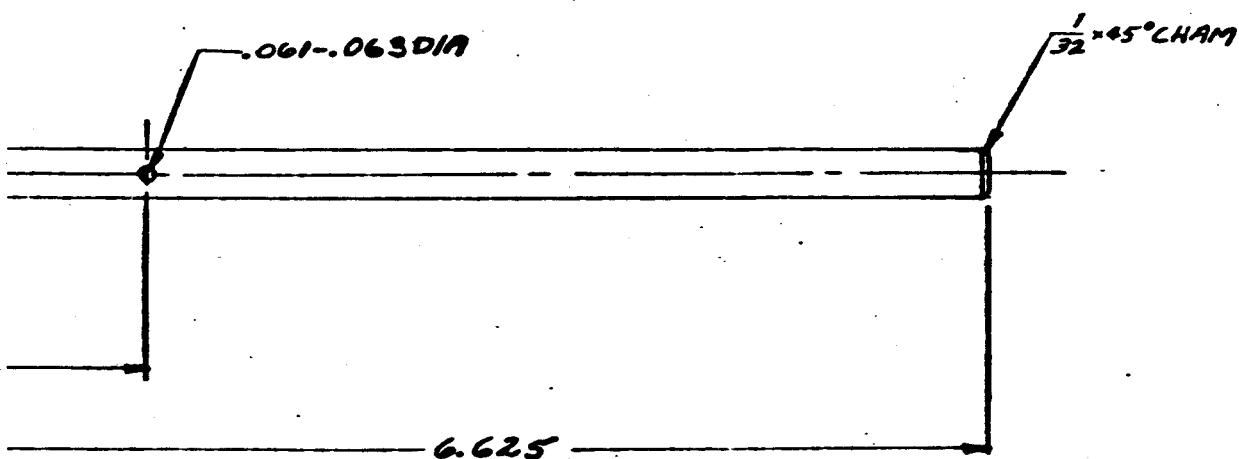


59①

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm \frac{1}{2}^\circ$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL
		ST. ST'L
NEXT ASSY	USED ON	HEAT TREATMENT
APPLICATION		#
		FINAL FINISH
		#

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543




M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	RECD
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### LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		SHAFT (ALITE 1-3-1C)	 GEOPHYSICS CORPORATION OF AMERICA		
DR	WFA		10-18-61		
CHK					
APP					
APP					
			DRAWING NUMBER		
			2-008-01-1037		
SCALE 1:1			LOC E	SIZE B	SH. / OF 1
					REV 0

CLASSIFICATION:

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543


M - MINNEAPOLIS

L - LINCOLN

B - BEDFORD

5		PRESS. SEAL VICTON #64055		PURCHASED	2
4	A2-008-01-1035	SPACER-TARGET HOUSING	ALUM		1
3	A2-008-01-1028	TARGET BEARING	TEFLON		2
2	A2-008-01-1029	CLAMP-TARGET BEARING			1
1	B2-008-01-1030	HOUSING-TARGET BEARING	304. S.S.		1
ITEM NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD

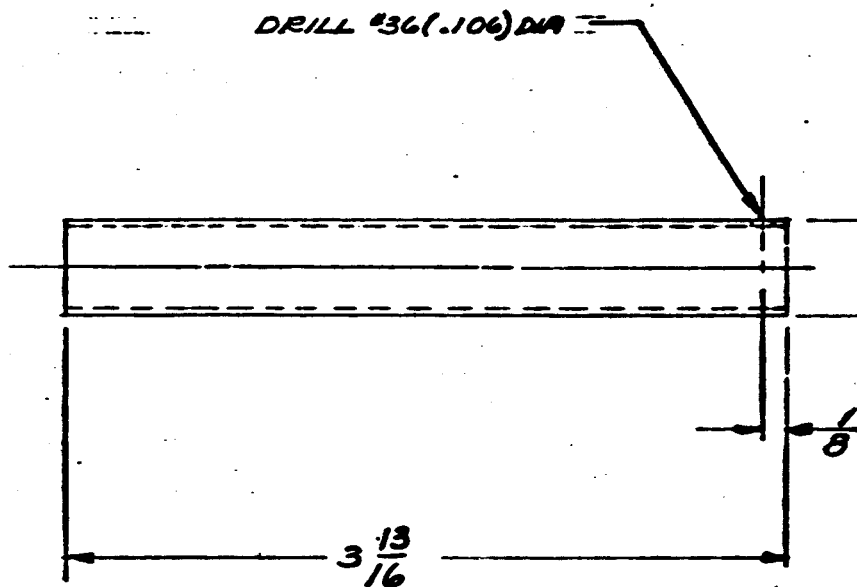
# LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA		ASSEMBLY-TARGET BEARING HOUSING	 GEOPHYSICS CORPORATION OF AMERICA	
DR WFA	1048-61			
CHK				
APP				
			DRAWING NUMBER	
			2-008-01-1038	
SCALE 1:1			LOC B	SIZE B
			SH. 1 OF 1	REV 0

CLASSIFICATION:

DIMENSIONS IN INCHES - DO NOT SCALE PRINT

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61-10

		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES
		TOLERANCES ON
		FRACTIONS $\pm \frac{1}{64}$ DECIMALS $\pm .005$ ANGLES $\pm 10'$
		MACHINE FINISH <input checked="" type="checkbox"/>
		MATERIAL $\frac{1}{2}$ O.D. X .032 WALL
		O.F.H.C. COPPER
NEXT ASSY	USED ON	HEAT TREATMENT <input checked="" type="checkbox"/>
APPLICATION		FINAL FINISH <input checked="" type="checkbox"/>

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
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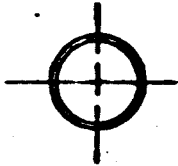
RE-ORDER No. 62-543

M-MINNEAPOLIS

L-LINGOLN

B-BEDFORD


$\frac{1}{2}$  DIA. REF.



2

M NO.	PART NO.	DESCRIPTION	MATL	MATL SPEC	REQD
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LIST OF MATERIAL

GEOPHYSICS CORPORATION OF AMERICA WFA 10-19-61		COOLING TUBE ~ DEFLECTION CONDENSER	 GEOPHYSICS CORPORATION OF AMERICA	
			DRAWING NUMBER 2-008-01-1039	
SCALE 1:1			LOC E	SIZE B

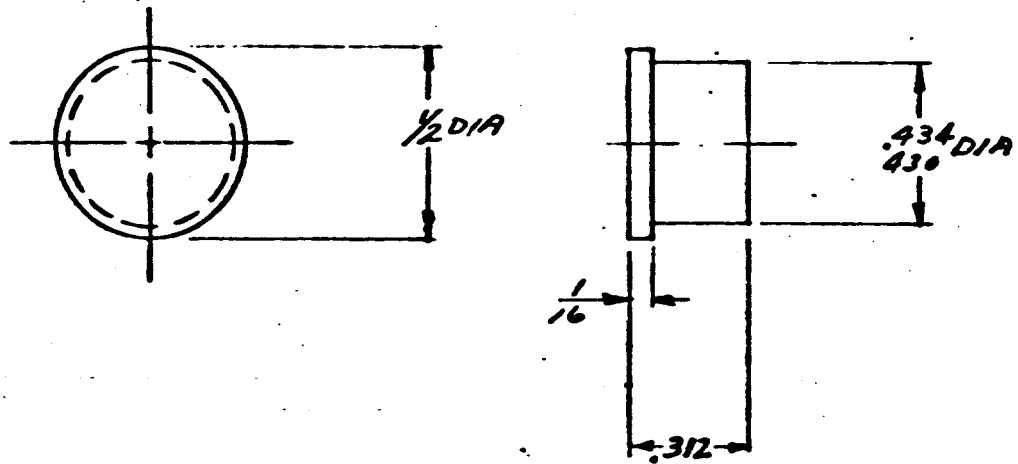
CLASSIFICATION:

DIMENSIONS IN INCHES — DO NOT SCALE PRINT

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APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRAC  $\frac{1}{16}$  DEC  $\pm .005$  AND  $\frac{1}{2}$   
MACHINE FINISH  $\checkmark$

MATERIAL  
D.F.H.C. COPPER

HEAT TREATMENT  
 $\checkmark$

FINAL FINISH  
 $\checkmark$

GEOPHYSICS CORPORATION  
OF AMERICA

DR	WFA	10-27-61
CHK	99C	11-3-61
APP		
APP		
APP		

CAP - TUBE



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE 2:1

2-008-01-1090

LOC 13 SIZE A SH. 1 OF 1 REV 0

CLASSIFICATION

M-MINNEAPOLIS

L-LINCOLN

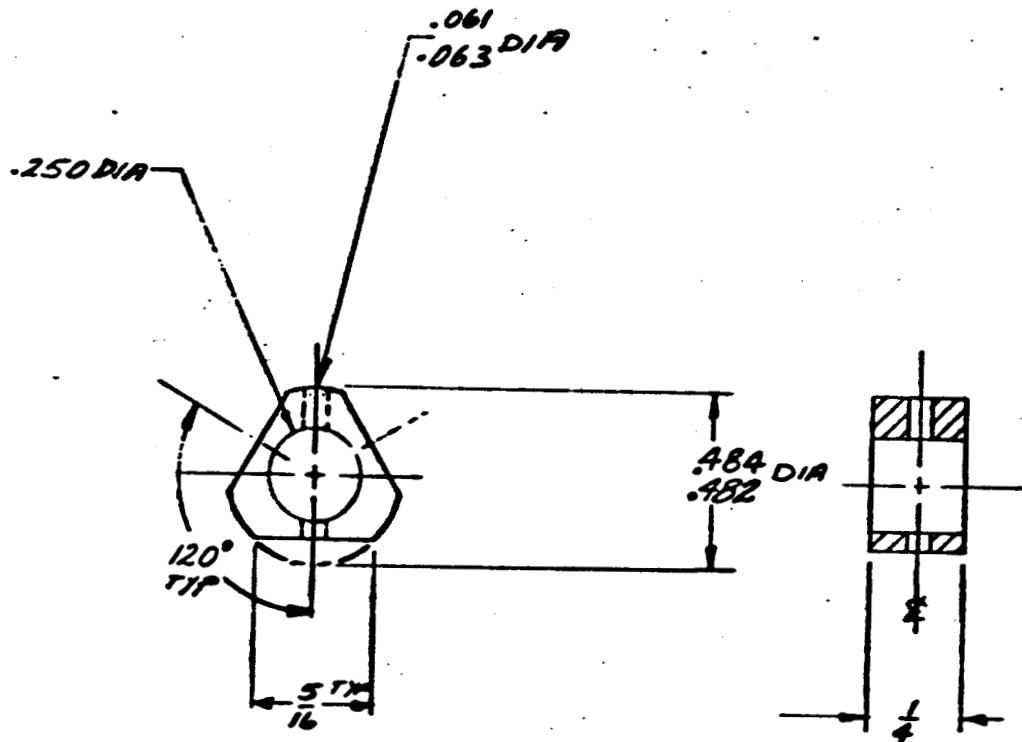
B-BEDFORD

DIMENSIONS IN INCHES — DO NOT SCALE PRINT

NOTICE — WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONFERRING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

APPLICATION			REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL	

RE-ORDER No. 62-543



M-MINNEAPOLIS

L-LINCOLN

B-BEAFORD

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRAC  $\pm \frac{1}{16}$  DEC  $\pm .005$  ANG  $\pm \frac{1}{2}$   
MACHINE FINISH ☒

MATERIAL  
COPPER

HEAT TREATMENT  
F

FINAL FINISH  
F

GEOPHYSICS CORPORATION  
OF AMERICA

DR	WFA	11-1-61
CHK	JD P	11-3-61
APP		
APP		
APP		

SHAFT-SPACER  
(ALITE 1-3-10)



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE 2:1

2-008-01-1041

LOC B SIZE A SH 1 OF 1 REV 0

63

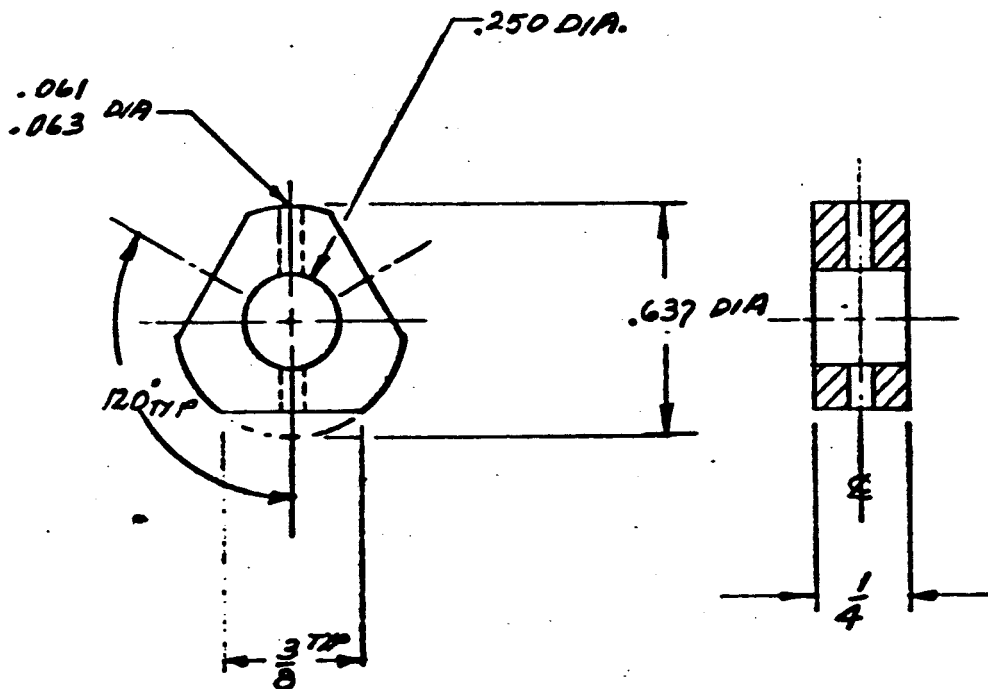


DIMENSIONS IN INCHES — DO NOT SCALE PRINT

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APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRACTIONS  $\pm .005$  ANGLES  $\pm .1^\circ$   
MACHINE FINISH

MATERIAL  
COPPER

HEAT TREATMENT  
H

FINAL FINISH  
H

GEOPHYSICS CORPORATION  
OF AMERICA

DR	WFA	11-4-61
CHK	JJC	11-2-61
APP		
APP		
APP		

SHAFT-SPACER  
(ALITE 2-5-1C)



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE 2:1

2-008-01-1042

LOC B	SIZE A	SH. 1 OF 1	REV 0
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M-MINNEAPOLIS

L-LINCOLN

B-BEDFORD

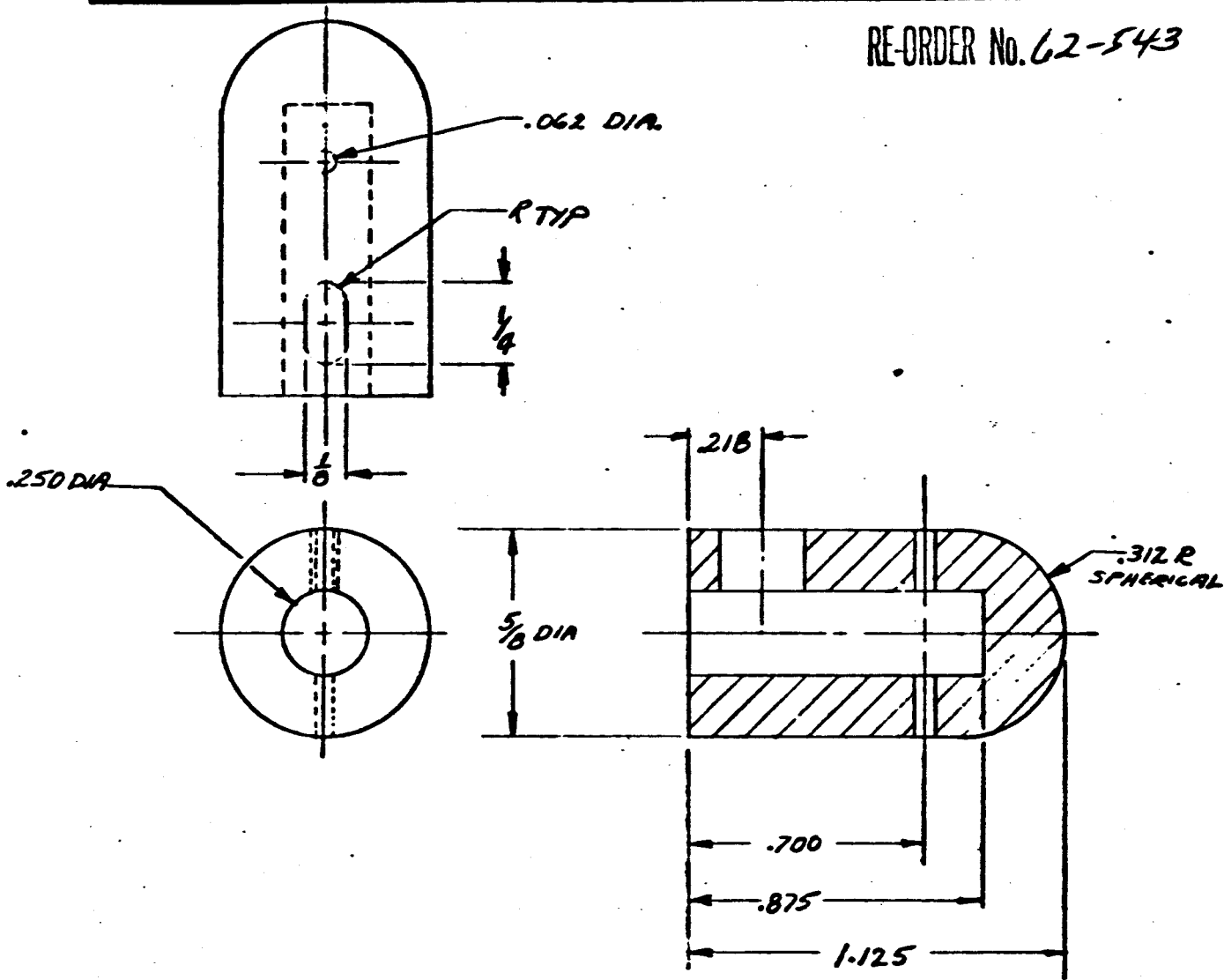
64


DIMENSIONS IN INCHES - DO NOT SCALE PRINT

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED	GEOPHYSICS CORPORATION OF AMERICA	HOUSE - SPRING		 GEOPHYSICS CORPORATION OF AMERICA
DIMENSIONS ARE IN INCHES	DR WFA 11-2-61			
TOLERANCES ON	CHK S S C 11-3-61			
FRAC. 1/10 DEC. .005 ANG. 1/8	APP			
MACHINE FINISH	APP			
MATERIAL	APP	SCALE 2:1		2-008-01-1043
COPPER		LOC B		SIZE A
HEAT TREATMENT		SH. / OF /		REV 0
FINAL FINISH				

M-MINNEAPOLIS

L-LINCOLN

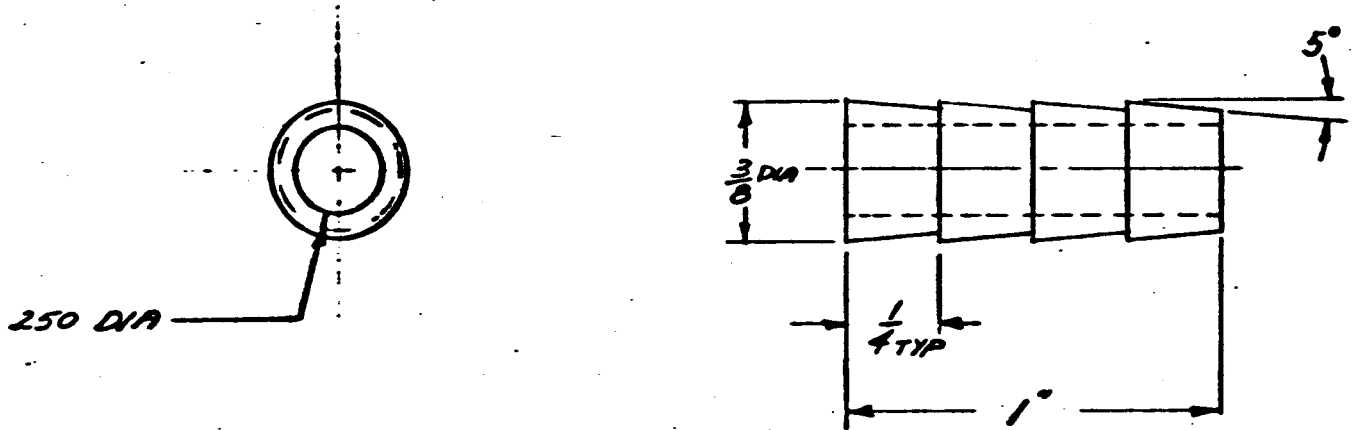
B-BEDFORD

DIMENSIONS IN INCHES — DO NOT SCALE PRINT

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APPLICATION			REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL	

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON  
FRACTIONS DECIMALS AND 1/2  
MACHINE FINISH ✓

MATERIAL

BRASS

HEAT TREATMENT

HL

FINAL FINISH

72

GEOPHYSICS CORPORATION  
OF AMERICA

DR	WFA	11-2-61
CHK	JJC	11-3-61
APP		
APP		
APP		

TUBE CONNECTION



GEOPHYSICS  
CORPORATION  
OF AMERICA

SCALE

2:1

2-008-01-1094

LOC B SIZE A SH. 1 OF 1 REV 0

M-MINNEAPOLIS

L-LINCOLN

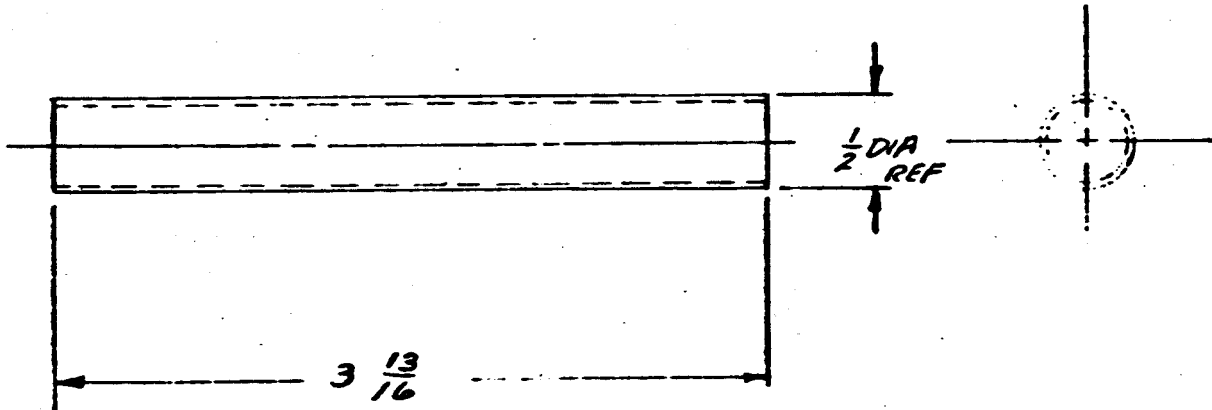
B-BEDFORD


DIMENSIONS IN INCHES — DO NOT SCALE PRINT

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APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVAL

RE-ORDER No. 62-543



UNLESS OTHERWISE SPECIFIED		GEOPHYSICS CORPORATION OF AMERICA		 <b>GEOPHYSICS CORPORATION OF AMERICA</b>	<b>TARGET HOUSING TUBING.</b>	
DIMENSIONS ARE IN INCHES		DR <i>WFA</i>	11-6-61			
TOLERANCES ON		CHK				
FRAC. $\frac{1}{16}$ DEC. $\frac{1}{32}$ ANG. $\frac{1}{2}$		APP				
MACHINE FINISH ✓		APP				
MATERIAL $\frac{1}{2}$ O.D. TUBING		APP		SCALE <i>1:1</i> <b>2-008-01-1045</b>		
F. H. C. COPPER		APP				
HEAT TREATMENT				LOC <i>B</i> SIZE <i>A</i> SH. <i>1</i> OF <i>1</i> REV <i>0</i>		
FINAL FINISH						

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120	121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200	201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300	301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400	401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500	501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600	601 602 603 604 605 606 
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